FIRST STEPS
IN
GENERAL KNOWLEDGE.

THE ANIMAL KINGDOM.

RB59492

Library

of the

University of Toronto

FIRST STEPS

IN

GENERAL KNOWLEDGE.

PART III.

THE ANIMAL KINGDOM.

PUBLISHED UNDER THE DIRECTION OF
THE COMMITTEE OF GENERAL LITERATURE AND EDUCATION,
APPOINTED BY THE SOCIETY FOR PROMOTING
CHRISTIAN KNOWLEDGE.

LONDON:
Printed for the
SOCIETY FOR PROMOTING CHRISTIAN KNOWLEDGE;
SOLD AT THE DEPOSITORY,
GREAT QUEEN STREET, LINCOLN'S INN FIELDS;
AND 4, ROYAL EXCHANGE.
1848.

LONDON
R. CLAY, PRINTER, BREAD STREET HILL.

CONTENTS.

THE ANIMAL KINGDOM.

PAGE
Conversation I. Radiate Animals.—Sponges 7
,, II.—Polyps 16
,, III.—Infusory Animals 32
,, IV.—Sea-Nettles 41
,, V.—Sea-Stars—Sea-Urchins 52
,, VI. Articulate Animals.—Worms—Leeches 62
,, VII.—Millipedes and Centipedes 73
,, VIII.—Insects in general 77
,, IX.—Insects.—Straight-winged—Half-winged...... 96
,, X.—Net-winged—Membranous-winged 110
,, XI.—Scaly-winged 123
,, XII.—Two-winged—Wingless 141
,, XIII.—Spiders 151
,, XIV.—Lobsters, Crabs, &c. 161
,, XV. Molluscous Animals.—Snails, &c. 174
,, XVI.—Cuttle-Fish, &c. 192

PAGE

CONVERSATION XVII. VERTEBRATED ANIMALS.—Fishes.... 200

,, XVIII.—Reptiles 219

,, XIX.—Birds.—Web-footed.—Waders, &c....... 228

,, XX.—Whales.—Ruminants, &c................. 248

,, XXI.—Animals having Claws.— Gnawing — Pouched—Carnivorous 265

,, XXII.—Monkeys.—Conclusion..................... 293

FIRST STEPS IN GENERAL KNOWLEDGE.

PART THIRD.

The Animal Kingdom.

CONVERSATION I.

SPONGES.

Summer had drawn to a close; the harvest fields were cleared of their riches almost to the last sheaf, and autumn fruits were rapidly maturing in orchard and garden, when the three children, Henry, Mary, and Robert, accompanied their papa and mamma to a retired spot on the south-western coast, with the prospect of spending some weeks by the sea-side.

The younger children now had their first view of the sea, and Henry was delighted to show his superior knowledge by answering their questions, and pointing out the different objects which a former visit had made familiar to him. He soon taught them to imitate his example in chasing the waves on the shore, or in searching among pebbles and sea-weed for specimens that might adorn the cabinet at home. Not a day passed without adding something to the store of the young travellers: Mary learned the art of spreading out sea-weed to the best advantage, and drying and arranging it in beautiful forms, and Robert was daily finding shells or star-fish, to excite his wonder and admiration.

It is true that the specimens, such as they were, could be procured only by diligent search. Indeed, some other visitors at the same spot declared that it was a dull and uninteresting part of the coast, and that nothing pretty was to be found on the beach. But when three pairs of sharp eyes and busy hands were constantly at work, exploring sand and rock and shingle, with an industry to which they had been early trained, it is not surprising that, at the end of six weeks, the children were able to take home a very respectable collection of specimens, some of which were even honoured with a place in their father's large cabinet.

In the course of their search after curiosities, they were often surprised to find that what seemed a bit of dry leather, or a mere mass of jelly, was in reality an animal substance. The first time Robert saw a star-fish, he caught it up eagerly, without any idea of its nature; but when the creature began to contract its brown rays or arms, the little boy threw it down in great surprise, and could not be persuaded to touch it again for some time afterwards. The children were often bringing some object to their papa, with the question, "Is this an animal or a vegetable?" and they now learned, for the first time, how very nearly the animal and vegetable kingdoms approach each other in their lowest tribes.

Robert felt almost angry, one morning, when his brother told him that he was using an animal substance to wash his face with, and a vegetable one to dry it. He appealed to his papa whether Henry was not very much mistaken in calling sponge an animal substance.

"Not at all," said his father. "What you hold in your hand is not indeed the living animal, but a sort of frame-work or skeleton of the sponge."

"A skeleton, papa, and yet so soft!" exclaimed Robert.

"By calling it a skeleton, I merely mean a support to the animal: naturalists call it the *axis*, or basis of the sponge. Although so soft and yielding, it is somewhat of the nature of horn, and smells like it when burnt."

"And how does the sponge look when it is alive?" asked Mary.

"The whole of this skeleton," said her father, "is then clothed with a very soft kind of flesh, which, through a microscope, looks like transparent jelly, and is so delicate, that a very slight pressure of your fingers would tear it, and let out all the fluid parts."

"I suppose that would hurt the poor sponge very much."

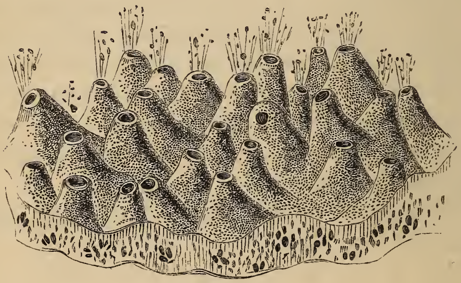
"Certainly not, Mary; for this creature is so low in the scale of animal existence, that it has never yet shown any signs of feeling. It has been pinched with forceps, torn in all directions, bored with hot irons, and attacked with different powerful chemical substances, and yet it has never shrunk up, or shown the slightest appearance of sensation."

"How very odd!" said Henry. "Even a plant will sometimes shrink up when it is touched; and there are a great many flowers that open their eyes when the sun shines, and shut them again at night; but this dull unfeeling sponge seems to do nothing at all."

"The sensitive plant might, indeed, appear more deserving of a place in the animal world than the sponge, if we attended only to these signs of feeling," replied his father; "but there are other things to be considered. The peculiar smell of sponge, when burning, shows its animal nature; and more than this, the microscope has lately shown a remarkable circulation in the body of a sponge, by which the animal is doubtless nourished."

"How do you mean, papa?" said Robert.

"Observe the piece of sponge you hold in your hand. The interior is composed of a vast number of tubes opening into each other; and on the outside you see a multitude of very small pores or holes, with some larger ones. When you dip the sponge in water, it fills rapidly, and if the animal were living, and you had a microscope, you would see that while it thus drinks in water at all the small pores, it sends it forth again in powerful streams at the large ones, and that in these streams there are small opaque masses, which are strewed everywhere around. No doubt the sponge finds nutriment from substances contained in the water, and rejects such as are unsuitable to its nature."



LIVING SPONGE,
(*With the Currents, as seen through a Microscope.*)

Mary wished to know whether the sponge moves about, like other animals, or is always fixed to one place.

"Have you not heard," said Henry, "that it grows upon rocks in the sea, and that there are caves and grottoes under water, quite lined with it? Of course it never moves."

"Do not be too certain," replied his father.

"All full-grown sponges are indeed fixed to the rocks on which they grow, but they send forth little buds, or young sponges, which are carried away by the streams I have spoken of, sometimes to a considerable distance from their parents, where having found a proper resting-place, they also settle down for life. These buds are egg-shaped, and are at first provided with minute *cilia*, or hairs, which move rapidly like tiny oars, and thus help to urge them along in the water. When the sponge becomes fixed, these hairs are no longer wanted, and therefore disappear."

"Then," said Mary, "the little sponges go away from their parents as soon as they are born, and never come back any more. Unfeeling little creatures! Why cannot they stay on the same rock, and grow up side by side with the old ones?"

"If they did so, an immense mass of sponge would be collected on one rock, while others, perhaps, would be bare; for it is in calm and tranquil spots that sponges are found, and they are so firmly fixed that a quiet sea cannot carry them from place to place. The wandering propensities of the young sponges are, therefore, of great use in distributing this useful production throughout the seas."

BRITISH SPONGE. (*Halichondria oculata.*)

"What is the reason of the difference in sponges?" asked Henry. "The nursery sponge is much coarser than the small one I have on my slate; and the sponge the servants use in cleaning the windows is coarser still, and very dark looking."

"There are many different varieties of sponge, and these again differ according to the spots they inhabit. Sponges grow to a large size within the tropics, and become smaller and more dense as we approach the polar regions. There is a sponge to be found on our own shores that is much branched, and almost tree-like in its form. There is also a green-looking fresh-water sponge, not uncommon in rivers and ponds, and this sometimes grows nearly a foot high, and is divided into branches like a leafless shrub."

Henry and Robert agreed that on their return home they would have a search for river-sponge; but they were disappointed to hear that it is so soft as scarcely to be handled without tearing, and that it has a most disagreeable smell, like that of stagnant ditches.

CONVERSATION II.

POLYPS.

"You told us, papa, that sponges hold the very lowest place among animals. I wish you would describe the creatures that come next above them, and then the next and the next, until you come to the highest of all."

So spake Henry, soon after the foregoing conversation; and his father, though aware that the task was a long and a difficult one, yet kindly promised to attend to his request, and to endeavour to give him a general outline of the animal kingdom.

Mary and Robert were as much pleased as their brother at this promise, for they knew that their father would show them many pictures of animals, and would find out something interesting to say about them.

"The class of animals, next in order to sponges, is a very large class, formerly called Zoophytes, but now more generally known as Polyps. They grow abundantly in the tropical seas, where they are often seen in large masses attached to rocks."

"Then they are fixed to one place, like the sponges."

"Very many of them are so; but before I speak of these, let me describe to you the simplest form of polyp; one that is to be found in our own rivers and ponds, and which is able to move in a very curious manner."

"And will you show it to us, some day, papa?" said Mary.

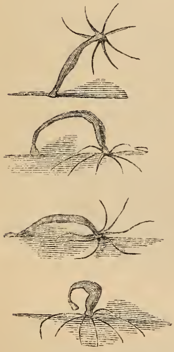
"Certainly, if you will remind me of it when we are near some slow-running river, or clear pond. Among the weeds of such waters we shall be very likely to meet with this little fresh-water polyp, the name of which is *Hydra*."

"Is the hydra at all like a sponge?"

"Not in appearance. The sponge is a mass of tubes and fibres, with innumerable openings: the hydra is a single delicate tube, open at one end and closed at the other, where there is a minute sucker, which helps the animal in moving along."

"The hydra seems more simple than the sponge," said Henry. "I wonder it should be placed higher up in the scale of animals."

"You will see that it deserves its position, before I have finished its history. The young sponge, you remember, has little hairs, which serve the purpose of arms, and enable it to move in the water. Now the hydra has a number of such arms placed round the opening which we may call its mouth, and these do not fall off, but remain, and spread out or contract at the pleasure of the animal. In this way it seizes its prey, which consists of small water-worms and other minute creatures. In some species of hydra these arms are short, in others they are exceedingly long and slender. Whenever an insect touches one of them it is immediately secured and conveyed to the mouth. These arms are properly called *tentacula*, or tentacles."


FRESH WATER POLYP.
(*Hydra.*)

The children were here shown a picture of the hydra, in its different attitudes, as it creeps along the stems of aquatic plants. They saw that it first stretches itself out as far as possible, then takes hold with its arms and draws the body forward, then fixes its sucker and stretches out again to take another step. They were told that the animal can greatly extend its skin, so as to swallow a worm or other creature, larger, perhaps, than itself. The body of the hydra is so transparent that the food can be seen within it.

"The hydra must be a voracious little creature," said Mary, "to swallow so much food at once. Does it live entirely on insects and worms?"

"In its natural state it does so; but you might keep it for a short time on minced fish, beef, mutton, or veal."

"If we find some of these creatures," said Mary, "I hope mamma will allow me to keep a few in a glass of water, that I may watch their odd manner of walking, and of feeding."

"The most curious part of the hydra's history is yet to come," said her father; "if the body of one of these creatures is cut in half, each half quickly becomes a perfect hydra; and if cut into four, or eight, or even forty pieces, each piece continues alive, and becomes a new animal. Even a small bit cut off one of the tentacles, or arms, is sufficient to produce another of these strange beings."

The children were much surprised to hear this; and Henry said he should not have believed it, if any one else had said so.

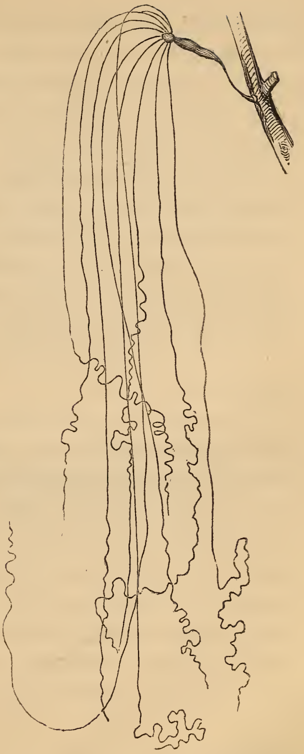
"I do not wonder at your surprise," said his father. "When this fact was discovered in 1744, it occasioned the greatest astonishment. The learned men of the day were continually making experiments with these poor worms, and sending them to one another from distant countries, as very precious gifts; and it is said that even ambassadors interested themselves in forwarding the earliest intelligence of the experiments to their respective courts."

"How odd that such little creatures should make so much noise in the world!" said Henry.

A picture was here shown of a species of hydra, which has very long and slender arms, as fine as a spider's web; but the children were not encouraged to hope they should ever find such a one, the animal being much less common than the short-armed kind. They were told that the different species of hydra are multiplied by buds growing all over their bodies, and these, when perfect, fall off and become distinct animals.

"How much they seem like plants," said Henry, "in having buds, and in growing again after they are made into a great many cuttings. Perhaps the water they live in nourishes the cuttings just as the earth does the cuttings of plants, when we put them into the ground."

"You will find something to remind you of plants in all these lower tribes of animals," said his father. "Some of them are so strikingly like flowers that they are known as plant-like animals, and are often named



LONG-ARMED HYDRA. (*Hydra fusca.*)

after the flower they most resemble. But I must now describe to you what are called compound polyps. Some of these have the appearance of a great number of hydræ collected into one body, and therefore resemble sponge, except that the arms of the animals, spreading out on all sides, remind one of the slender petals of flowers."

"When there are so many together," said Mary, "it must be very awkward for them to move about, especially if some wish to walk when the others would rather stand still."

"Or if they all want to go different ways," suggested Robert.

"Neither of these uncomfortable circumstances can happen," said their father, "for the animals, like sponges, are fixed to one spot. Other compound polyps have a solid axis or skeleton, with innumerable cells on the surface. These are the corals of which you have seen specimens in my cabinet. When fixed by their solid base to the rocks, the animals, which are often of most beautiful colours, resemble thickly scattered flowers on a glistening bank or silvery tree."

"But the corals in your cabinet look like pieces of stone," said Henry. "Where does that stony substance come from, and what is it made of?"

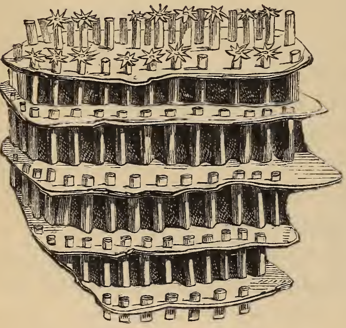
"It is deposited by the animals themselves from their own bodies; and wonderful as this may appear to you, it is a fact with which you will grow familiar as we proceed. The substance itself is called carbonate of lime, and is produced abundantly in a vast number of animals, helping to form shell and bone."

"I now remember that you told us something about this, when you described the coral islands of the South Seas," remarked Henry.

"I did so; and the animals I then spoke of as forming the reefs and lagoons, are some of the compound polyps I am now describing. The number of coral animals is so great that I cannot attempt to give you the names of the several families; but you have yourself witnessed something of the variety of their dwellings. You cannot have forgotten the beautiful collection of corals you saw in the British Museum last year."

"Oh no," said Henry, "I shall never forget them, they are so very wonderful, especially that large mass of red coral that is made up of thousands of beautiful little pipes, all distinct from each other, and yet fastened together in such a curious way."

"You mean the *Tubipora musica*, resembling organ-pipes: it is indeed a most astonishing example of industry and united labour. That each little animal should build up and inhabit its own separate tube, and yet form a plate to unite it with all the rest, and that the whole should be so regular and uniform as it is, must surely excite the greatest delight in all who see and understand this noble specimen."



THE ORGAN-PIPE. (*Tubipora musica.*)

Mary and Robert, who had never been to the British Museum, wished very much to see some of this wonderful coral, and their papa showed them a drawing made of a small portion of Tubipora musica, in which the living animals were represented projecting from the tubes. He told them that these animals are of a brilliant grass-green colour, and the mouth is furnished with eight arms.

"Do you remember, papa, the splendid Brain-corals* we saw in the Museum?"

"Perfectly. They are beautiful and curious masses of coral, and in their natural state are covered with a thin layer of a soft jelly-like substance, and with myriads of very small animals, having short arms: when these arms are expanded and in motion, it is said that the surface seems alive with countless beings, all eager in acquiring food or in extending their cells. The variety in coral seems indeed endless: there are some with the cells resembling clusters of cup-shaped flowers,† others with star-like cells, the inhabitants of which are very beautifully coloured, resembling green flowers with a deep blue disk;‡ others that are quite tree-like, having elevated cells all over the branches, that give the appearance of foliage;§ others that are jointed, and wave to and fro in the water, bearing their living investment of fleshy rind and cells; * others that resemble bending osiers or beautiful fans; † and others that look not unlike the feather of a quill." ‡

---

* Meandrina.

† Pavonia.

‡ Astræa.

§ Madrepore.

"And which of all these is the smooth red coral § that is made into necklaces?" asked Mary.

"The coral prized in commerce is not one of those I have been speaking of, although it is tree-like in its appearance and very beautiful. The skeleton is of a fine deep red, and is not pierced with holes, like many other species, but is covered in every part with a whitish rind, in which the animals make their cells. Here is a drawing of a piece of living red coral, with the rind and cells partly removed, to show the smooth branches beneath. There are numerous coral fisheries in the Mediterranean Sea; but the coral is so slow of growth, that the same spot is not dragged oftener than about once in ten years."

"How do they drag for it, papa?" asked Robert.

"In a very rough way. They make a large cross of wood, with a heavy weight in the centre, and fasten nets securely to the arms of the cross. This apparatus is then let down from a boat by a

---

* Isis.

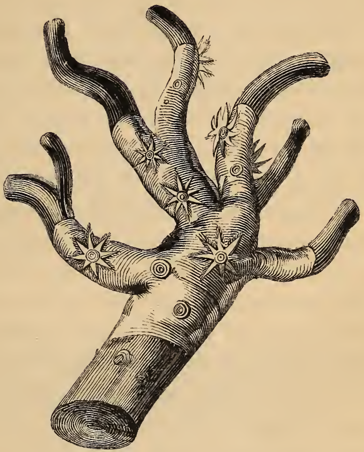
† Gorgonia.

‡ Pennatula.

§ Corallium rubrum.

strong rope, and the boat is rowed over the coral beds. The heavy cross breaks off branches of coral, and some of these fall into the nets; but no doubt a great number are lost."

"What a pity!" said Mary. "I should like to live on the shore near one of those coral fisheries; for I dare say there would be plenty of beautiful red branches washed up by the tide."



LIVING RED CORAL. (*Corallium rubrum.*)

"Not *red* branches, Mary," said her elder brother. "The coral is covered with a whitish rind."

"And this rind, on drying, becomes like chalk," continued their father. "I must also tell you that when the coral is left in its native bed to grow to the full size, and is becoming old, the living rind gradually dies away, and leaves the skeleton bare, which then becomes subject to the attacks of minute boring animals, and is soon destroyed. We will now turn from the corals to the animals called *fleshy polyps*. These still more closely resemble flowers, and are, many of them, common on our own rocks and shores."

"Then we shall be able, perhaps, to find some, during our stay here," said Henry.

"Doubtless. Meanwhile I will describe to you the general appearance of the Sea Anemone,* that you may know what to look for. Imagine, then, a soft fleshy cylinder, fixed at one end to a rock or stone, and fringed at the other with several rows of tentacles, or arms, which spread out like the petals of a flower, and are beautifully coloured, so as to resemble the blossom of an anemone. The top of the cylinder is closed with a disk, which has an opening in the centre, forming the mouth of the animal. The numerous arms are employed in catching prey and conveying it to this mouth, which appears ever ready to receive and swallow young crabs and other animals of a kind which would seem beyond the powers of a polyp to master."

---

* Actinia.

"In that respect it is like its relation the hydra," said Henry, "which is a voracious little creature, and fond of attacking animals larger than itself."

"True," replied his father, "and this is not the only thing in which they are alike, for the sea-anemone, if cut in pieces, will become so many distinct animals, in the same wonderful way as the hydra, but not so rapidly. If the arms are all cut off from the sea-anemone, it takes two months before it gains another complete set."

"Poor creature! What does it do for food all that time?"

"No doubt it gains much nourishment from the water itself, in which there are multitudes of animals, too small to be seen by our unassisted eyes. If Mary wishes to watch the habits of a polyp, this sea-anemone would be more convenient, from its size, than the hydra."

"But, papa," said Mary, "if they are fixed to the rock, would it not be cruel to tear them off?"

"They may be removed without the least

injury, by the cautious use of a thin knife with a broad blade, passed between the animal and the surface to which it clings."

"Let us collect a great many while we are here, and carry them home with us," said Robert.

"That would be useless, unless you could get sea-water to keep them in. They require change of water every day, and will then live some time without other food than they find in it. Between the stomach of the sea-anemone and its outer skin, there is a cavity which can be filled with water at pleasure, through a small opening at the extremity of each arm, at which it is drawn in. By closing these orifices, and forcing the water from the body into the arms, the creature is able to expand them in search of prey; but it can also as quickly empty them of water, and then the arms shrink and disappear. It is very interesting to watch them distending themselves with water, and spreading out their richly-coloured arms, and, on the least alarm, folding them up again, and contracting into a firm fleshy mass."

"Are they always so timid?" said Mary, "or is it only when they are taken away from their own rock?"

" They are at all times very sensitive of danger, and also of changes in the weather: the passing of a dark cloud over the sun is sufficient to make them contract their arms, so that they are never seen to perfection except in bright weather. The purple sea-anemone of this coast looks very beautiful on a sunny day, having tentacles of the finest violet colour, often tinged with pink or yellow."

" Oh, papa, how I long to see it!" said Robert. " We will all have a good search for it, when this cloudy weather has passed away."

Henry wondered how these creatures could bear the storms of winter, if they are so sensitive of changes of weather. His father told him that they loosen their hold of the rock in that season, and while some commit themselves to the mercy of the waves, others creep along at the bottom of the water, making use of their tentacles as feet, until they find a suitable spot to fix in, at a greater depth, and where the cold is less severe.

CONVERSATION III.

INFUSORY ANIMALS.

The next morning the children returned in high spirits from a walk with their mamma on the shore, for they had found among the rocks at low tide, in a little hollow containing clear water, several beautiful sea-anemones. The creatures themselves were of an olive-green colour, but their tentacles were purple, tinged with various colours. Henry had succeeded in removing one of them from the rock, and had brought it home in a glass of sea-water. Remembering what his father had said about the little animals which live in water, he looked very earnestly at it through a small microscope, hoping to discover some of them; but in vain.

"Will you tell me, papa," he said, "what the little creatures are that live in water, and why I cannot see them through my microscope?"

"Your microscope is not powerful enough; and if it were so, you would not have so good an opportunity of seeing the animals in this water, as in that of ditches and ponds."

"The creatures must have an odd taste to like such disagreeable places," said Mary.

"Before the discovery of the microscope," said her father, "it was little suspected that every drop of stagnant water swarms with multitudes of living creatures; but this can now be proved by any one possessing a microscope of high power. It is only to skim off the duck-weed from some pond fully exposed to the sun's rays, and plenty of these infusory animals (as they are called) will be found."

"Why are the animals called by that odd name?" said Henry.

"You have heard, perhaps, that a vegetable substance steeped in water, makes an *infusion.* A Danish naturalist, finding that all infusions of animal and vegetable substances which had been kept a sufficient time, swarmed with these creatures, called them infusory animals. Chopped hay, or straw, or the leaves of plants, if left in open vessels of water exposed to the air and sun, will, in a few days, abound with very curious forms of animal life."

"I hope there are none of these creatures in the water we drink," said Mary, looking very much alarmed.

"Fresh water as well as salt abounds with animal life," said her father; "but the pure water of springs is much less likely than any other to be filled with these creatures. Nevertheless, we must unavoidably swallow many of them."

"I am so sorry I know it," said the little girl, "for I shall not like to drink water now."

"You need not make yourself uncomfortable about these invisible creatures, especially as the gastric juice of the stomach instantly destroys them. Depend upon it, there is nothing injurious in them, or they would not be permitted to exist in the common drink of man and beast."

"What do these creatures look like, when they are seen through a microscope?" asked Robert.

"The smallest are mere points or globules, and you will get some idea of their amazing minuteness, when I tell you, that a single drop of stagnant water contains about five hundred millions of them."

"Dear papa, this is more wonderful than any thing else you have told us!" said Henry. "All these creatures in one drop! and there must be millions of drops to make up a pond, and hundreds and thousands of ponds, I dare say, in different parts of the world."

"It is, indeed, a subject of endless wonder, and our ideas soon become confused when we dwell upon it. It is almost impossible to realize that one drop of water can contain a number of living creatures nearly equal to that of all the human beings on the surface of our globe; which must be the case if these numbers are correct."

"I wonder you did not begin the animal kingdom with these little specks of beings, instead of with the sponges, papa," said Henry.

"You will be astonished to learn that by means of the microscope the internal structure of these minute animals has been discovered, and is found to be exceedingly curious. While in the sponges there is nothing that can be called a stomach, and in the polyps only the very simplest form of stomach, it appears that the infusory animals have a digestive apparatus, consisting of a number of tiny sacs or stomachs, so that in many books, instead of being called by their old name, they have the new title of *Polygastrica*, which means, 'having many stomachs.' Therefore, as being less simple in their structure than the tribes we have been speaking of, they are rightly placed higher in the scale of animal life."

"But is it quite certain about these stomachs?" said Henry. "Would it not be very easy to make a mistake with such tiny creatures?"

"Very easy indeed. But we trust to the patience and caution of a very eminent naturalist, who fed these creatures sometimes with pure carmine, sometimes with indigo, which passing into these little stomachs, made them distinctly visible through the transparent skin. Other observers have doubted whether these objects are real stomachs, or whether they are only little grains, such as have been seen in the transparent body of the hydra, and which are likewise subject to be tinged with the colour of the food taken by the animal."

"Are the infusory animals all alike?" said Mary, "and do they all look like transparent globes?"

"By no means. They are of various shapes, and are divided into two groups, one having soft bodies, the other having a covering of extremely fine and delicate shell. These latter assist in the changes that are going on upon the surface of our globe, for as they die in countless myriads, their shells, mixed with other substances, help to form clay, flint, chalk, &c. Thus, even creatures that are quite invisible to us while floating in water, may become deposited in vast multitudes, so as to be of great importance in the earth. If Robert will fetch my dressing-case, I will show you the remains of a vast assemblage of these microscopic beings."

Robert ran upstairs in great haste, wondering, as he went, how his papa came to put infusory animals into his dressing-case.

When the dressing-case was brought down and opened, the children were surprised to see their father take out the hone on which he was accustomed to sharpen his razors. "This," he said, "is called Turkish stone; but you will be astonished to learn that it is in reality a mass of the fossil remains of these animals.

The children looked earnestly at the hone, and each wished to handle and examine it; but they could only express their wonder; for they were not able to make out any thing that looked like the shells of animals.

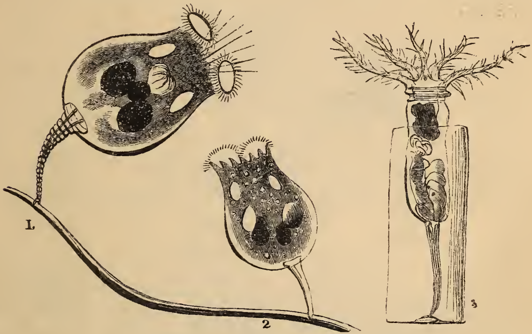
"I have another strange thing to tell you about these creatures. On the shores of a lake near Urnea, in Sweden, there is a great quantity of a white powdery substance, which the inhabitants call *mountain meal.* This they collect and mix with flour to form bread. It is said to be tolerably nutritious; but, perhaps, the people who eat it are not aware that this meal is nothing more than a mass of the shelly coverings of infusory animals. They accumulate at the bottom of the lake, and when the water retires from certain parts, they dry and become mealy, so as to resemble flour."

"Then these poor people not only drink the animals in water, but eat them in bread; or at least they eat their shells, which is nearly as bad," said Henry. "I wish," he added, "that we could see some of these creatures alive and swimming about in water."

His father told him that by searching in stagnant water, they might be able to find a large species, which is visible to the naked eye,* but they must be contented to wait for a sight of the smaller kinds until they met with a powerful microscope, or until they went to London, and saw the extraordinary magnifying powers of the oxy-hydrogen microscope. He also showed them

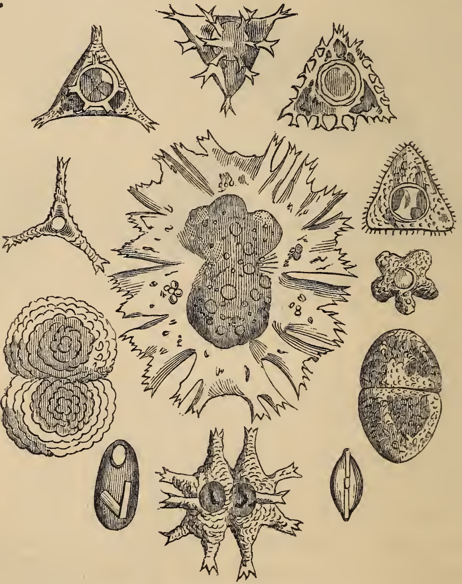
---

* Bursaria truncatella.



WHEEL-BEARERS.

a picture of some curious creatures, which were formerly classed with infusory animals, but are found to possess a higher organization. These are called wheel-bearers *(Rotiferæ)*, because their cilia or hairs move so rapidly as to appear like wheels turning round. Each animal is partly enclosed in a transparent and delicate shell, shaped like a goblet, and having a stem or tail, by which it attaches itself to aquatic plants. These curious creatures are only to be seen through a microscope, but are exceedingly active; multitudes of them performing rapid evolutions in a single drop of water.



INFUSORY ANIMALS AS OBSERVED BY EHRENBERG.

CONVERSATION IV.

SEA-NETTLES.

"Look, papa, at this strange mass of jelly," said Henry, as they were taking their usual walk on the shore,—"pray come and look at it, for I think it seems to be melting away in the sun, just as that did which I wanted to show you a few days ago."

His father examined it and told him that it was what people call sea-jelly, or sea-blubber, or jelly-fishes. As it now lies," he continued, "there are no signs of motion, and very few traces of its curious structure."

"Do you mean, papa, that it was ever alive?"

"Certainly; and this specimen before us appears to me to have been so recently thrown up by the waves, that I doubt not, were you to handle it, you would have a disagreeable proof of its being alive still."

"What would it do, then, papa?"

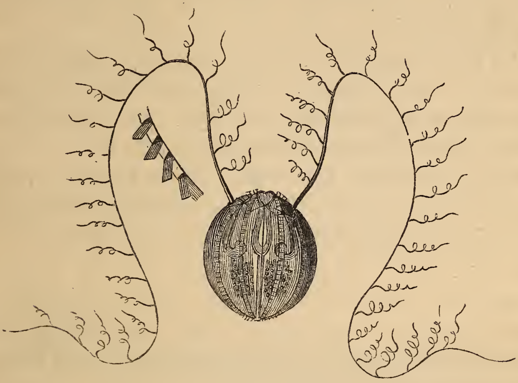
"This loose edge or fringe which you see around it, would cause a stinging sensation in your hand. In some other creatures of this family, the pain caused by the sting is considerable, and is accompanied with inflammation. Hence there are other common names given to these animals, as sea-nettles, stingers, and stang-fishes. It is on this account, also, that naturalists call the whole class *Acalepha,* which signifies 'a nettle.'"

"Are all the sea-nettles as ugly as this?" said Mary.

"I do not admit that this is ugly," replied her father; "but there are many specimens that are much prettier, especially those which give out phosphorescent light. You have heard of the *medusæ,* which light up the surface of the ocean in warm countries."

"Oh yes, papa," said Henry; "but those are very little creatures, and I should not have guessed that they belonged to the same family as this large mass of jelly."

"All the medusæ are not equally small. There is one called the Girdle of Venus, which is like a long flat piece of riband; and another, called Beroe, which is quite round, and also of considerable size. I remember reading a very interesting account of the phosphorescence of the medusæ, both large and small, written by a scientific gentleman, who had seen this beautiful sight in the Mediterranean sea. He described it as not being a constant light, but given out in broad flashes that can be seen for miles. These flashes occur when a passing breeze sweeps over the face of the ocean, or where the sea is agitated by the progress of the ship, in whose wake there is a long track of splendour. The oars of a boat,



GLOBULAR BEROE.

when raised, are dripping as with living diamonds, and a little of the water taken in the palm of the hand and slightly agitated, appears full of bright points."

"Those must have been the tiny creatures I read of," said Henry, "which can only be seen through a microscope, and yet give out light. What did he say about the large ones?"

"He described some Beroes that were vividly phosphorescent, and said that the Girdle of Venus, as it glides rapidly along, has the appearance of a waving riband of flame, several feet in length; while some others of the larger species shine with such dazzling brightness, that they look like cannon-balls, heated to whiteness, far down below the surface."

"How very different all those creatures seem to be from our sea-nettle!" said Robert.

"You must not judge of this specimen by its present appearance, for even while we have been talking, it has dwindled away considerably. Its natural form is not unlike that of a large mushroom, the upper part being hemispherical, while from the under side hangs a mass of wrinkled and fringed organs, which probably serve the purpose of tentacles or arms. These animals contract and open the disk with great regularity about fifteen times in a minute. They are full of sea-water; and when thrown ashore this escapes, and leaves nothing behind but a delicate filmy substance, almost like cobweb."

" Do not let us forget to look at this creature again when we come back from our walk," said Mary, " for I should like to keep the remains of the poor sea-nettle."

" I have yet one more of these creatures to describe to you," said their father, " and you will be amused to hear that it is called the Portuguese Man-of-war."

" What an odd-name for a sea-nettle!" said Henry. " Is it so much larger and handsomer than all the rest that it looks like a man-of-war among little ships?"

" The name has been given to it because the animal has the power of erecting a sail or crest, by means of which it skims along upon the surface of the water. I have a volume of 'Gosse's Zoology' in my pocket, and I am sure you will be pleased with what I am going to read to you about the Portuguese Man-of-war:—' In the tropical parts of the Atlantic,' says Mr. Gosse, 'this lovely creature abounds, looking at a short distance exactly like a child's mimic ship, and attracts our wonder and admiration to see so delicate and frail a bark breasting the broad billows, as it seems that the first breaking sea must inevitably overwhelm and dash it to pieces. Yet, there it floats and dances,—now on a curling crest, now in the deep hollow, in spite of wind and wave. Often when passing just under the lee of a vessel, the sudden lull made by the interposition of so great a body between it and the wind, will cause it momentarily to lie flat on the water, but it instantly resumes its upright position. We have never made a voyage without seeing these creatures in greater or less number, but nowhere in such profusion as in the gulf of Mexico. In rounding the Florida reef, we were once nearly a whole day sailing through a fleet of them, which studded the smooth sea as far as the eye could reach. They were of all sizes, from an inch in length to a foot or more. When examined closely, the animal is seen to consist of an oblong transparent bladder, pinched up at the upper part into a kind of rumpled edge; this edge is of a delicate pink, but the lower part of the bladder is fine blue, and both these colours are gradually softened into the clear membrane, the middle of which is colourless. From one end of the bottom proceeds a large bunch of tentacles like strings, hanging down in the water; these are of a brilliant purple."

The children were delighted with this account, and wished they could see a fleet of these beautiful creatures. Their papa showed them a picture which represented some of these animals sailing on the ocean, but this, of course, showed their form only, and not their lovely colours.

" And what becomes of them in a storm?" asked Mary.

" They have the power of diving suddenly to the lower parts of the ocean, where they remain until the storm that agitates the surface has passed away, when they again appear, spreading out their little sails."

" Pretty little creatures!" said Mary. " The name of sea-nettle is really not good enough for them, and I am glad they have a better name."

" And yet they sting as sharply as any of their family," remarked her father. " A gentleman who took hold of one of the animals, found that it raised its tentacles, and stung him severely on the second and third fingers. At first, the sensation was just that of being stung with a nettle; but it increased to violent aching, and in a quarter of an hour the whole hand and arm, and even the shoulder and chest were affected: the breathing also became difficult. These alarming symptoms continued for half an hour, when they gradually abated; but the arm was benumbed for some hours afterwards."

The children were very much surprised, and rather vexed, to hear that such an innocent-looking little creature could sting so severely; but they were better satisfied when their father told them that this power is given to it not only as a means of self-defence, but, in all probability, for the purpose of benumbing the animals on which it feeds.

While speaking of the beauty of the Portuguese Man-of-war, Mary had expressed a wish to know what animals came next to the sea-nettles in the ladder of animal life, which their papa was leading them up.

"If you talk of a ladder," said Henry, "I do not know when we shall reach the top. Let me see;

sponges, polyps, infusory animals, sea-nettles: we are only at the fourth round of the ladder yet."

"And I will detain you there a minute or two," said his father, "to speak of some creatures, whose history is too painful to dwell on long, although they should properly occupy a separate 'round' in your imaginary ladder of life."

"What are they called, papa?"

"Intestinal worms, or worms living in the bowels of other animals."

"How shocking!" exclaimed Mary. "Are there many animals that have these creatures living in them?"

"All animals, from the meanest insect up to man himself, are subject to the attacks of these creatures; and they exist not only in the bowels, but in various other parts of the body. One of them, called the *fluke*, inhabits the liver of sheep, and of other animals; while the thread-worms and tape-worms are only too well known as inhabiting the intestines of human beings."

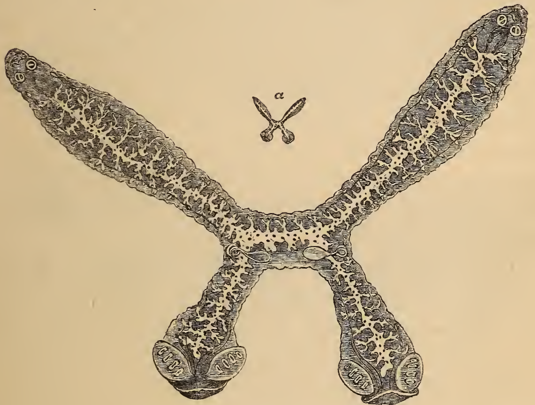
The children thought this very dreadful, and eagerly inquired whether everybody had these creatures, or only some persons. Their father told them that the larger species are only found in unhealthy animals, and may always be considered as tokens of disease, but many microscopic species are common in healthy as well as unhealthy subjects. He also warned them that children who disorder their stomachs, by eating unripe fruits and other unwholesome food, are very often attacked by an intestinal worm, which grows to a great length within the bowels, and causes a great deal of pain.

"One of the most remarkable of these animals," he continued, "is a worm called the twin-worm, which inhabits the gills of a fish (the common Bream). This creature possesses two bodies, joined together by a band, and having suckers at the four extremities. Here is a drawing of it, both magnified and of the natural size."

The children looked at it, and remarked how unlike it was to any worms they had ever seen. Their father then told them, that all these creatures, commonly called intestinal worms, are very different in their structure from true worms, and must not be confounded with them; and that the proper name of these creatures is *Entozoa*, from two words, signifying "within," and "an animal."

“ Can you tell how these creatures get into the body?” asked Henry.

“ I cannot,” answered his father. “ It is very humbling to the pride of human reason, that we have no means of knowing how these creatures are produced, or what purpose they serve in the animal world.”



TWIN-WORM. (*Diplozoon Paradoxum.*)

CONVERSATION V.

SEA-STARS—SEA-URCHINS.

ROBERT was very glad to hear his father say that the next class of animals he should describe would be star-fishes. The children had met with many of the common sea-star, or five-finger, on the shore, some of which were living, while others were mere dry skeletons. On taking up a living one, they had always found that it gave a strange creeping sensation to the hand, which they could not account for, and which they now asked the reason of.

"This is caused," said their father, "by the wonderful structure of the under part of the rays, for these creatures have generally five rays, spreading out from a centre, which is called the 'disk.' They are named *asterias*, or star-fish, from *aster*, a star, because they resemble the shape we call star-like. If you have a living specimen, I will show you the curious apparatus in the rays."

Henry brought one, which he had been keeping in sea-water.

"Now let us examine this creature very closely. What do we see on the upper side?"

"A thick and rough skin," said Henry, "something like leather; and so tough, that it would not be very easy to pierce it. In some of the larger ones, it is almost as hard as a shell."

"And what do we find on the under side?" said his father, turning the animal on its back.

"A hollow place in each arm, with raised spots in regular lines. They look very pretty, but I do not know the use of them."

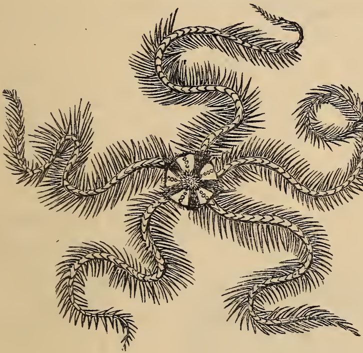
"The hollow place or groove in each ray was called by Linnæus the avenue, because it reminded him of a walk between rows of trees, for each groove contains four rows of small holes like pin-holes, through every one of which rises a slender fleshy tube, which serves as a foot or sucker."

"What a number of feet the animal must have!" said Mary. "I think there must be a hundred in this one ray."

"The naturalist, Reaumur, counted three hundred and four in each of the five rays, making fifteen hundred and twenty in all. The structure of these feet is not a little remarkable. Each foot consists of a tube closed at the end, and connected with a sac or reservoir of fluid. When the animal wishes to put forth its feet, it forces the fluid from the sacs into the tubes, which accordingly appear through these holes; but on withdrawing the fluid again, the tubes contract and retire into their respective holes, just as you see these at present."

"That reminds me of the sea-anemone," said Henry, "which has the same odd way of filling and emptying its rays or arms. But where is the mouth of our star-fish?"

"This opening in the centre is the mouth, and is capable of being greatly enlarged to take in small shell-fish, which are swallowed entire. The rays fold over the prey and convey it to the mouth, and the numerous feet or suckers hold it fast. You will be again reminded of former tribes, when I tell you that a star-fish losing one of its rays is soon furnished with a new one; and that in some other species, called Brittle-stars, the animal actually throws off its rays on the least alarm, and escapes with only the disk, so that it is almost impossible to procure a perfect specimen. Yet, after this frightful mutilation, the disk will, in the course of time, put forth fresh rays, and appear as perfect as before. Speaking of the brittle-star, Professor Forbes says, 'Touch it, and it throws away an arm; hold it, and in a moment not an arm remains attached to the body.'



BRITTLE-STAR.

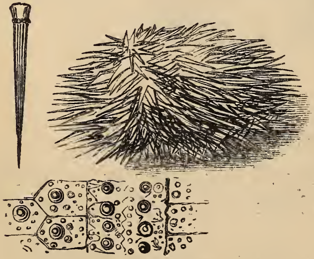
The variety and beauty of star-fishes are so great, that separate works have been written on their history."

The children were much amused at the idea of throwing off an arm by way of self-defence, and they thought that all the animals their father had yet described must have very little sense of pain, or they could not so easily part with their limbs, and bear the cuttings and divisions he had spoken of.

"You remember the curious creature we found on the shore a few days ago, which I told you was called a sea-urchin."*

"Oh yes, papa," said Mary. "It was like a round box covered with bristles, or perhaps more like a small hedgehog; but you told us that when these bristles are removed, the shell is seen to be very prettily marked."

"True: there are beautiful and regular grooves passing down the sides of the globe; and having double rows of small openings with tubes like those in the ray of the sea-star. There are also double rows of little knobs, ar-



GREEN-PEA URCHIN.

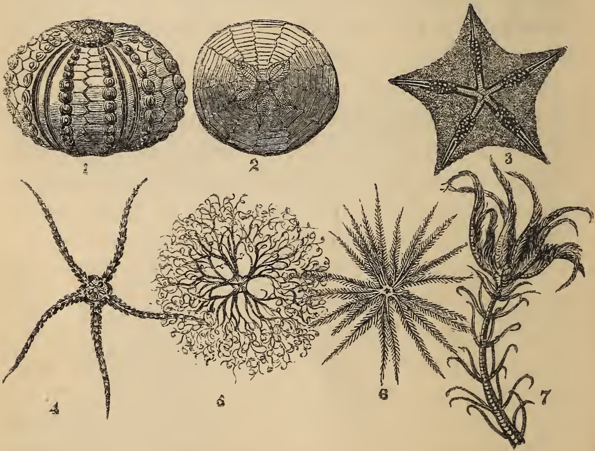
---

* Echinus.

ranged with perfect regularity, serving for the support of the bristles, which have sockets at their base, exactly fitting them. These ball-and-socket joints allow free motion to the spines in every direction, so that they act as levers, and, together with the feet, assist the sea-urchin to move along smooth surfaces at the bottom of the sea. To show you how beautifully the habits of each animal are provided for, there is a family of these creatures, called *Spatangus,* which buries itself in the sand, and in this case the bristles on the back are much longer than those on the rest of the body, so that when the animal is lying buried, these long bristles prevent the sand from closing completely, and preserve a small round hole for the admission of water to the mouth."

A picture was now shown to the children of several kinds of sea-stars, as well as of the sea-urchin deprived of its spines.

" That fourth specimen here represented," said their father, " is one of those sea-stars in which the rays are like the tails of serpents; hence their name *Ophiurus,* from two Greek words, signifying ' serpent' and ' tail.' The fifth is called *Medusa's head,* and you see the five rays branch out into numerous snaky locks; the sixth is *Comatula,* or the Hairy Sea-star, so called from having the rays covered with numberless short filaments like the beards of a feather. The seventh specimen closely resembles it, but is placed on a stem, the base of which is fixed to a rock. This last is called the Lily-stone (*Pentacrinus*)."



STAR FISHES.

Fig. 1. SEA-URCHIN. 2. SEA-SHIELD. 3. SEA-STAR. 4. SERPENT'S TAIL. 5. MEDUSA'S HEAD. 6. HAIRY SEA-STAR. 7. LILY-STONE.

" When the rays are long and thin, as they seem to be in some of these creatures," said Henry, " is there the same apparatus of hundreds of feet, and of openings for them, as there is in my star-fish ?"

" There is not," replied his father. " The feet are then found only on the disk, or central part of the body, which you see is very small."

Henry wondered how they were able to move about, until his father told him that the long rays themselves serve the purpose of legs or arms, being much more flexible than those of the common sea-star.

The children were now told that they had arrived at the end of one great division of the Animal Kingdom. "I have only been able to speak to you of the more striking families; but still we have gathered some notion of the large collection of creatures called by naturalists *Radiata*, or radiate animals, from having their organs spreading out from a centre in a circular form."

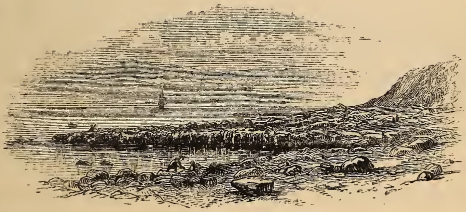
" Are they all called so ?" said Mary ; " the star-fishes might have that name on account of their rays, but why should the others have it ?"

"Consider a moment," said her father, "and you will see that all the creatures we have yet talked about, have rays or tentacles or cilia, and these spread outward in a star-like form."

Henry counted them over, and found that sea-anemones, sea-nettles, wheel-bearers, hydræ and coral-animals, all have fringes or hairs or arms, which may be called rays. "But sponges, papa," he said, "have certainly no right to be called radiate animals."

"You forget that even these are possessed of minute rays, if we may so call the little hairs which encircle the infant sponge, and which are only cast off when there is no further use for them."

Henry acknowledged that he had quite forgotten the little sponges, and was only thinking of the large masses. His father went on to say, that all radiate animals are nearly destitute of the senses which are so remarkable in higher beings, and seem to have little more than the sense of touch. They have no heart, no circulation of blood, and generally, no distinction of sex. "Yet," he said, "who will dare to despise these little creatures, when they think of the vast coral reefs of the Pacific Ocean, and remember that they are the work of a very low order of radiate animals; and when, again, they hear of great changes going on upon the surface of our globe, in which the microscopic animals of this division bear an important part. "To my mind also," he continued, "there is nothing in earth or sky, which shows in a more astonishing manner the infinite working of the Almighty hand, than a single drop of stagnant water, with its five hundred millions of perfect and wonderful inhabitants."



CONVERSATION VI.

WORMS.—LEECHES.

"Now you have finished telling us about the radiate animals, papa, I hope we shall mount another step of the ladder, to the animals next above them," said Henry. "What are they?"

"A helpless and despised race," replied his father; "but one that is not without important uses to mankind. I mean worms."

The children wondered that their father should call worms useful, for they had often heard the gardener at home complain of the trouble they caused him in the gravel paths, and on the lawn; and when digging in what he called the worst bits of ground, they had seen him turn up a great quantity of worms.

"If you ask the uses of worms," said their father, "I will answer you in the words of Gilbert White:—'Earth-worms,* though in appearance a small and despicable link in the chain of nature, yet, if lost, would make a lamentable chasm. For to say nothing of half the birds and some quadrupeds which are almost entirely supported by them, worms seem to be great promoters of vegetation, which would proceed but lamely without them, by boring, perforating, and loosening the soil, and rendering it pervious to rains and the fibres of plants; by drawing straws and stalks of leaves, and twigs into it; and most of all, by throwing up such infinite numbers of lumps of earth, called worm-casts, which being their excrement, is a fine manure for grain and grass.' "

---

* Lumbricus.

"Then why does the gardener dislike them?" asked Robert.

"It is natural that he should do so, since they throw up those little hillocks which disfigure his paths; but in open pastures and clay soils, where appearances are not so much studied as in gardens, the existence of worms should be considered an advantage, for they are great improvers of the land, which without their aid would often become cold and hard-bound."

"I have often wondered," said Mary, "how worms can move along as they do, without feet."

"They have indeed no limbs properly so called," said her father; "but their bodies are composed of a great number of rings, amounting to one hundred and twenty; and on the under side of these are situated exceedingly small hairs or bristles, four pair on every ring, which take hold of the ground as the animal moves along."

The children were astonished to hear of these bristles, and asked how it was they had never seen them.

"Because of their small size, and also because the worm does not thrust them out until the moment they are wanted. In moving along, it first stretches out the head and foremost rings, and takes hold of the ground with the bristles of these parts, then draws forward the remaining parts of the body, and in turn presses those bristles against the earth."

"And yet," said Henry, "when I take up a large worm, it does not cling to the ground as if it had feet."

"What do worms live upon?" asked Mary.

"Upon decaying substances, both animal and vegetable, mixed with a large portion of earth. They have no teeth nor eyes, but a thick fleshy lip or margin to the mouth, with which they draw in their food. They can lengthen their heads to a fine point, and in this way, and by strongly contracting their bodies, they are able to bore holes in the ground as places of retreat and safety."

"And they always choose damp places, do they not?" asked Henry.

"They certainly prefer moisture, and thus their labours are directed just where they are most wanted to drain and lighten the soil; but continual wetness destroys them, and where floods are very frequent the worms are all drowned."

"I wish I had known that before," said Mary; "for a poor worm once fell into the watering-pot when we were gardening, and I allowed it to stay there, thinking it would enjoy the water; but the next time I used the watering-pot, I found the worm at the bottom quite white and dead."

"The earth-worm is in this respect very different from its relation the leech,* which belongs to the same class of animals," said her father.

"Do you mean the leech that people use in medicine, papa?"

"I do; and these animals, you know, live in water, and swim about in it by waving their bodies in a serpentine manner. You have seen their movements through a glass vessel, and you have heard me speak of the leech fisheries abroad, where a man is seen walking about in pools, allowing the animals to fasten on his naked legs."

---

* Hirudo.

"Oh yes, papa, and the poor man always looks pale and ill, and he sometimes throws bits of raw meat into the water, and when the leeches have gathered round it, he catches them all, and puts them into a vessel of water."

"And afterwards," said Henry, "he stows them all away in a little bag which he has on his shoulder; and carriers take them about in wet sacks on horseback, packed very closely together."

"It is enough to kill them, to be all huddled together in a sack without room to move," said Robert.

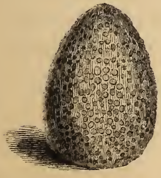
"The leech is not so easily killed," replied his father. "It will bear very hard usage, and even when frozen is sometimes thawed into life again."

"I thought they were delicate creatures," said Mary; "for those we had at home all died, though they had fresh water every day."

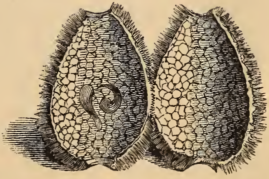
"Those leeches had been used to extract blood, and were not likely to live long. Although leeches in their natural state feed on animal substances, yet they have no opportunity of sucking blood to the extent that they do when applied to our bodies: it is therefore an extraordinary and providential circumstance, that these creatures possess, even to their own hurt, so great a thirst for blood, and can be made so useful in checking the progress of many kinds of disease."

"Have leeches any little bristles, such as the earth-worm has on its rings?" inquired Robert.

"No: the body of the leech is perfectly smooth and beautifully marked, and has at each end a fleshy disk which acts as a sucker, and which the animal employs in moving along. The leech lays its eggs in the mud of ponds, enclosed in a singular case, or cocoon, within which the young leeches come to life."



COCOON OF LEECH.



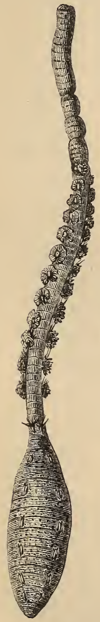
THE COCOON OPENED, SHOWING YOUNG LEECHES.

"It has teeth, I know," said Mary: "for I have heard people speak of its sharp bite!"

"The teeth are very curious, being saw-like, three in number, and arranged in the form of a triangle. The mouth is situated in the middle of the front sucker, and near to it are eight or ten eyes, so minute as only to be discovered by the microscope. But I have other worms to notice, and must not dwell too long on these, important as they are."

"Oh, papa," said Robert; "I dare say you can tell us what kind of worm it was that we saw on the shore a few days ago. It was of a brighter colour than the common worm, and it had such curious little crimson tufts on its sides."

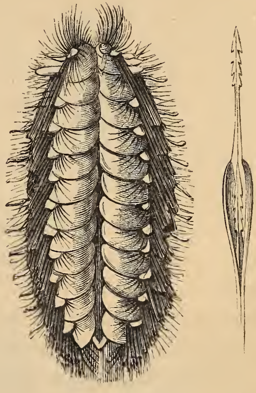
"That was the sand-worm or lug-worm, which fishermen use so much as a bait. It bores tunnels in the sand, and as it lives principally under water, it has gills, or a breathing apparatus somewhat like that of fishes, and these are the red tufts you speak of. It has also little organs, varying in shape, which serve the purpose of feet."



SAND WORM, OR LUG.

"I did not expect to see any thing so pretty on a worm, as those bright coloured gills," remarked Henry.

"You would then be very much surprised at the sight of another kind of worm, called the sea-mouse. This animal is only about five or six inches long, and is much more oval in shape than other worms; but what is so remarkable in its appearance is, that it is covered with a series of glittering plates, and from its sides project tufts of bristles of a beautiful golden colour, with blue and green reflections, equal in brilliancy to the lustre of gems."



SEA-MOUSE.
(*Halithea aculeata.*)

"What a lovely creature it must be!" said Mary. "Are its bristles of any use, or only for ornament?"

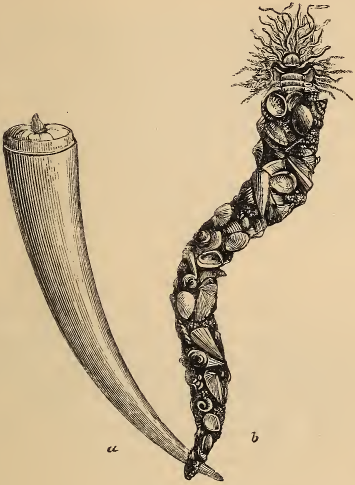
"They are useful as a means of defence, being pointed and barbed like an arrow. But the animal has the means of drawing them in when not in use, and at such times each little arrow becomes enclosed in a horny sheath, so that it does no injury to the skin of the animal. This curious mechanism can only be seen through a microscope; but is highly illustrative of the wondrous care bestowed on the construction of every living thing."

"Worms are much more curious and interesting than I expected them to be," said Henry.

"You will be ready to say the same of whatever object in nature you begin to study," said his father. "We live in the midst of so many wonders and curiosities, that life is too short to make us acquainted with half their excellence. Every intelligent person is a learner during his whole life; and at its close, however diligent he may have been, he still feels himself to be merely on the threshold of knowledge. It is one of the great pleasures of life, that there is always something new to learn."

"Then we must make the most of our time," said Henry, "if there is so much to be learned."

"Certainly; let us therefore hasten forward in our sketch of animal life. There are yet other curious worms whose habit it is to form a tube round their bodies, of sand, or small stones and shells."



TUBICOLA.

"Do you mean caddis-worms?" asked Henry.

"No," replied his father, "but animals that have a very similar method of working. They are called *Tubicola,* or dwellers in tubes; and they have the gills placed very near the head, so that they project from the mouth of the tube."

"How do they manage to make these tubes?" asked Mary.

"A glutinous matter oozes from their skin, and either becomes a horny covering, or attaches to itself grains of sand and small shells. In some species the worm is observed to collect the shells, and fasten them in a sort of ring round its head, using the glue to cement them together; then by adding others it gradually lengthens the tube, so as to form a covering. These worms, as well as the others we have spoken of, (only excepting the earth-worm,) are inhabitants of the waters; and all are raised above radiate animals, by the possession of red blood which circulates in a double system of arteries and veins. There is also another striking difference. In radiate animals it was impossible to speak of a right and left side, or of a fore and hind part; but we can do so in worms, and in all the animals above them. You must also notice how much greater the powers of motion are in worms than in any of the lower tribes."

CONVERSATION VII.

MILLIPEDES AND CENTIPEDES.

"Do you remember the animals you called me into your garden to look at, the day before we left home, Robert?" asked his father.

"Oh yes, papa; they were wood-lice. I had turned a flower-pot down over a little plant I wanted to take care of, and when I lifted it up, there were, I should think, twenty of them, some rolled up like a ball, and some lying flat on the ground. I never saw so many together before, and I wanted you to look at them; but before you came out, they had nearly all run away."

"You should have returned the flower-pot gently to its place, and they would not have crept away. It was the light that disturbed them; for they belong to a class of animals that lurk in shady places by day, and come abroad at night to seek their food."

Henry said, that he had sometimes seen a smaller creature, very much like the wood-louse, and rolling itself up in the same kind of ball, but quite black and shining, instead of the dull brown or earth-colour of the wood-louse.

"That is the Pill Millipede," said his father; "so called because it was formerly used in medicine, especially on the continent."

Robert laughed to hear this, and said, the creatures did indeed look very much like pills, when they were rolled up; but he should be very sorry to swallow one.

"Is there any difference between millipedes and centipedes?" said Henry.

"They closely resemble each other," said his father, "in having a great number of legs; but they may be known apart by their general shape: millipedes being curved or half-cylindrical, while centipedes are flat; millipedes having also the habit of rolling themselves up in balls, which centipedes have not. Millipedes are harmless creatures, feeding on decaying vegetable substances, and crawling at a comparatively slow rate; centipedes are active and voracious animals, living on insects and worms, and moving with great rapidity."

"I think I know them apart," said Henry. "Those flat creatures with hard, polished bodies, that move along so rapidly, must be centipedes. I sometimes turn one up when I am digging in my garden, and it is quite amusing to see how fast it runs away upon its many feet."

"Some of the centipedes," said his father, "are luminous, and one of them* may sometimes be seen on the grass of lawns during the summer evenings, winding its way like a silver thread. Centipedes in this country are too small to attract much notice, still less to become objects of dread; but in warm climates, where they grow to a large size, the case is very different."

"What harm do they do there?" asked Mary.

"The actual harm is sometimes very serious; but besides this, as they are more than a foot long, they excite great disgust in Europeans, when they are found lurking in corners of houses, or hiding under furniture and in drawers, or even creeping into their beds."

"How very disagreeable!" exclaimed Mary. "It would be bad enough to have one of our little centipedes running over one in the night; but this great creature must be very much worse."

"These formidable animals have a mouth provided with horny jaws, and also with two sharp fangs, which have a small opening near the tip, through which the centipede is able to send a poisonous fluid into the wound made by its bite. This bite, though rarely fatal, is said to be more severe than the sting of a scorpion."

---

* Scolopendra electrica.

"I do not wonder at people disliking and dreading the creature," said Henry.

"This class of animals," said his father, "approaches very closely to insects, and is by some writers included with them. Other persons find so many disagreements between them as to give them a separate place. Like insects, they pass through several changes before they arrive at their perfect state; but these changes are only an increase in the number of the segments or divisions of their bodies, and at the same time an increase in the number of legs; for each division has one pair, sometimes two pairs of legs attached to it. These creatures have eight eyes, arranged in a series of four on each side the head. They breathe through small pores along the sides of their bodies, called spiracles."

CONVERSATION VIII.

INSECTS IN GENERAL.

The children, while by the sea-side, were very anxious to have an opportunity of seeing the beautiful worm their father had described to them, called the sea-mouse; but they were unsuccessful. It was, however, a frequent subject of conversation with them, and Robert said that he thought it must be something like a large hairy caterpillar, only much more handsome. His father told him that caterpillars come very near worms in the arrangements made by naturalists.

" They look something like them," said Henry, " for their bodies are marked as if they had rings, or were made up of several divisions, like the centipedes; and they are often covered with little tufts of hair, or bristles. But they are better off than worms, for they have good strong feet, which can hold tightly to anything. I have often tried to take up a caterpillar, and found I could not get it off the plant without injuring it."

" Oh yes," said Mary, " and my silk-worms are just as bad: if I take hold of them they cling so firmly to their food that I bring up mulberry leaf and all."

"You should not force a caterpillar from its resting-place. If you wish merely to look at it, you should cut off the leaf or twig on which it is lodged; and if you, Mary, wish to make your silk-worms leave their old mulberry leaves, it is only to lay some fresh ones over them, and they will very quickly mount them of their own accord."

CATERPILLAR SUSPENDED BY ITS SILKEN THREAD.

"I have thought of another thing in which caterpillars are superior to worms," said Henry; "many of them are able to spin beautiful silk, which worms can never do."

"And I have thought of something else," said Robert: "caterpillars change into moths and butterflies, with all sorts of pretty colours and marks upon their wings; but worms never change."

"Centipedes change," said Mary; "but they never come out with wings, and fly about in the air."

"You have hit upon the grand distinction, Robert," said his father; "and a most wonderful one it is. The changes which insects pass through are so extraordinary that I could scarcely hope to make you understand them, had you not watched them for yourselves in the case of the silk-worm."

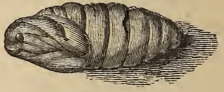
"But do all caterpillars change into butterflies and moths?" asked Mary.

"They all change into some kind of winged insect, and go through much the same history as your silk-worms: you can tell me what that is."

"Oh yes, papa. First, they are little eggs, no bigger than poppy-seeds; then they come out tiny black worms; and these, when they have been fed a long time on mulberry leaves, and have thrown off their old skins several times, grow to be fine, large, light-coloured caterpillars. The next thing they do is to spin a very pretty little nest of yellow

EGGS AND SILK-WORMS IN THE FIRST AGE.

silk, which they wind round and round their bodies till you cannot see them any longer. What they do next I cannot tell, for each one is wrapped up in the midst of his ball of silk; but when the time comes to wind the silk off, it is not a caterpillar we find inside, but a chrysalis,—an odd-looking, brown, shining creature, that scarcely seems like a living being at all. However, if we cover this brown thing over with bran, and keep it a few days, it breaks open its shining case, and comes out a large white moth. And this is the end of it; for when the moth has laid its eggs, it dies."



THE CHRYSALIS.

FEMALE SILK-WORM MOTH AND EGGS.

"Then how many different shapes does it appear in?"

"Three, papa. First the caterpillar, then the chrysalis, then the moth."

"All insects, properly so called, go through transformations answering to these three, though not always exactly like them. Caterpillars outwardly resemble worms, yet there is this remarkable difference; that they have, concealed from view, in their interior, all the organs of the perfect insect. The caterpillar has a number of membranous coverings which are thrown off one after another. These coverings, hiding the form of the future animal, have been compared to a mask, hiding the true features; on this account the animal wearing this disguise has been termed *larva;* which is the Latin name for a mask."

"I shall always think of that when I see a caterpillar," said Mary. "It hides its true face under a mask."

"And does not the chrysalis do the same?" asked Henry.

"We can scarcely call that a mask through which the features can be traced," said his father; "and in many cases, through the thin coating of the chrysalis we can clearly make out the wings, the antennæ, and the general form of the perfect insect."

"Then it is more like a veil than a mask," remarked Mary.

"A veil, covering a most curious and beautiful form. Insects are indeed so surpassingly elegant, so numerous, so varied, and so admirably formed, that I am quite at a loss how to describe them to you, and how to give you the most distant idea of their wonders."

"There must be a vast number of them," said Henry; "for in the height of summer the air seems full of them."

"You will see how impossible it is that I should do more than give the merest sketch of these creatures, when I tell you that there are about one hundred thousand species named and described; and that these are found in countless hosts, in all the countries of the earth, from the equator to the polar circles."

"It seems strange that any one should be able to find out how many species there are, among such a great multitude," remarked Henry.

"It is strange; and we are greatly indebted to the patience and skill of those accomplished persons who have devoted their lives to the studyof insects, and thus have brought to light so many wonders respecting this interesting part of the animal kingdom. One very ingenious plan by which they simplified the arrangement of insects, was by classing them together according to the structure of their wings; for instance, a very large number of insects have wing-cases for the protection of the true wings; these are called *Coleoptera*, from two words signifying *shield*, and *wing*. You are well acquainted with many of these insects, for they are what we call beetles."

"Oh yes, papa," said Henry, "I know them very well; many a one have I caught for the sake of seeing it burst open its hard wing-cases, spread the delicate gauzy wings that are under them, and fly away."

"Why, this is just what my dear little lady-birds do," exclaimed Mary. "Do they belong to this tribe?"

"Yes," replied her father; "and so does another great favourite of yours; I mean the glow-worm."

Mary was surprised to hear this, for when she was staying with her aunt in the New Forest, she remembered catching one of these insects, as it glittered beneath a little shrub on the lawn, and keeping it till daylight, when she found it a poor little, dull-looking insect, without any wings. Her papa now told her that the female glow-worm has no wings, but the male has wings and wing-cases, like the rest of the beetles. "Other insects of this kind are luminous," added he; "among which are the fire-flies of tropical America, some of which greatly exceed in brilliancy our little glow worm."

"Oh yes," said Henry, "that gentleman from the West Indies, who called on you the other day, told me that he has seen the ladies in Jamaica with fire-flies shining brilliantly in their hair, or as a trimming to their dresses."

"I think the gentleman must have been joking," said Mary, "for the fire-flies certainly would not stay in one place just to ornament the ladies' hair."

"They cannot help it," replied Henry, "for they are shut up in little bags of muslin or gauze."

"There are other beetles, which are very useful in medicine. I mean the blister beetles, of which that called the Spanish fly is used to make blister ointment, having the property of irritating the skin enough

BLISTER BEETLE.

to produce blisters. There is a small beetle used in Africa for the singular purpose of making soap, the body of the insect abounding in alkali, which, when mixed with some fatty substance, forms soap. These and numerous other species are found among coleopterous insects."

SOAP INSECT.

"Co-le-op-te-rous," said Henry, trying to master the hard word. "And this means 'with shields to their wings.' I think I shall recollect it; and if I do not, I shall be sure to remember that all the beetles have these shields, because I have so often seen it. But I thought, papa, that beetles mostly ran along the ground, and did not fly about so much as other insects do."

"There is one family that scarcely ever leaves the ground; they are called Ground-beetles,* and are often of beautiful colours, such as golden green, copper colour, or black with a purple gloss. There are again others, of equally brilliant colours, that run and fly by turns, and with exceeding swiftness, and are so voracious in their attacks on other insects that they are called Tiger-beetles.† These have very long and slender legs, flat bodies, and prominent eyes. There is also the Water-beetle, common in pools, and subsisting on tadpoles and other small animals; and there are little beetles, called weevils, one of which is very injurious to plum trees."

---

* Carabi.

† Cicindela.

COPPER-COLOURED WEEVIL, OR PLUM BORER.

"I should like to know the name of an odd-looking beetle I sometimes see in the garden," said Henry; "it is quite black, and has a long narrow body; and what is very strange, when I disturb it the creature directly bends the hinder part of the body upwards, and opens its jaws, running along in this position, and looking dreadfully angry. It is quite ridiculous to see such a little animal put on such a fierce look."

"I have no doubt you mean the Rove-beetle,* a disagreeable but useful creature, which feeds on putrid substances, and has itself a most intolerable odour. There are others called Burying-beetles,† which have the same taste for decaying flesh, and assemble in large numbers wherever anything of this sort is to be found. If the substance is large they burrow holes in it, and make it, for the time, their dwelling; if small, such as the carcase of a little bird, they scoop away the earth beneath it until the flesh is buried, then laying their eggs in it, they leave it to decay, and thus to afford food for their young."

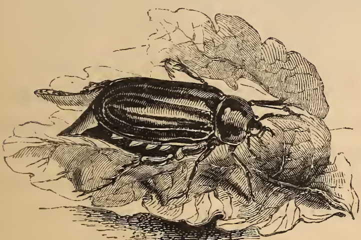
---

* Staphylinus.

† Silpha.

"What horrid creatures!" said Henry; "and yet I suppose we ought to be much obliged to them for getting rid of things that would soon make the whole air unpleasant, if they were left unburied."

"Another set of useful scavengers," said his father, "are beetles* that have the habit of burying their eggs in small pellets of dung, and then rolling these pellets along with their hind legs, and thrusting them into holes which they have before bored in the earth. This is a very large tribe



COCKCHAFER.

---

* Scarabæus.

of beetles, our own common Cockchafer being a well-known example. It is very destructive to pastures during its larva state, feeding on the roots of the grass. Here also we find the Stag-beetles, with jaws something like stags' horns; the Hercules and Goliath-beetles, so called on account of their large size. There are many large and exceedingly beautiful beetles in the tropical forests, which feed on timber, and burrow long galleries in it, so as greatly to check the accumulation of fallen timber which would otherwise take place. In this tribe we also find the sacred beetle of the ancient Egyptians."

STAG-BEETLE.

"A sacred beetle!" exclaimed Mary, in great astonishment. "What does that mean, papa?"

"You would scarcely believe it possible that any people should choose the beetle as an object of worship; but so it was. The image of this deity was carved not only in temples and on obelisks, but on different kinds of stone; it was fashioned into medallions of cornelian, engraved upon split pearls, and made into necklaces, rings, and seals. The image of the sacred beetle descended with the Egyptians to the tomb, small models of the insect being placed in their coffins. Some of these models have been found in the mummies, or embalmed bodies of Egyptians lately opened in this country. They were placed close to the person of the mummy, and wrapped up under many folds of bandages."

"Poor unhappy Egyptians!" said Mary; "they were satisfied with a very mean creature for their god. And yet, papa, they were not ignorant, like some heathens; at least they were not when Moses was living amongst them, for the Bible says that Moses was learned in all the wisdom of the Egyptians. Do you think they were so foolish as to worship this beetle when he was there?"

"I have no doubt of it; for besides that we have sculptures of the sacred beetle which are considered to be upwards of three thousand years old, and must therefore have been carved not very long after the departure of the Israelites from Egypt, there are also frequent allusions to the worship of creeping things in such passages of the Bible as that in Deuteronomy iv. 18, where the children of Israel are strictly forbidden to make a graven image, 'the similitude of any figure, the likeness of male or female; the likeness of any beast that is on the earth, the likeness of any winged fowl that flieth in the air; the likeness of any thing *that creepeth on the ground,* the likeness of any fish that is in the water beneath the earth.'"

Henry said he should very much like to know what made the Egyptians choose such a strange object of worship. His father informed him that the subject has been explained in several ways, but the most pleasing to dwell upon is, that the people saw in it a type of the resurrection. This beetle was observed to appear in great numbers immediately after the great inundations of the Nile, so that the popular notion was that it rose from the mud left by the river. Such a phenomenon might seem to the Egyptians a significant emblem of a future existence. But other accounts say that this beetle was consecrated to the deity of the sun, because of its habit of rolling along a ball with its hind legs, which ball the fanciful Egyptians considered to represent the earth, while the beetle itself, looking in the opposite direction, was regarded as an emblem of the sun, which appears to proceed through the heavens in a contrary course. If this was really the cause of the reverence paid to this insect, it is a singular instance of the power of superstition, which could turn the simple circumstance of an insect taking care of its eggs into a subject of religious belief and worship for a whole nation."

"I wish we could see some of those models of the beetle that have been found wrapped up with the mummies," said Robert.

"When I take you to the British Museum," replied his father, "I will show you not only those small representations, but a colossal figure of one of these beetles, hewn out of black granite."

"What is a colossal figure?" asked the little boy.

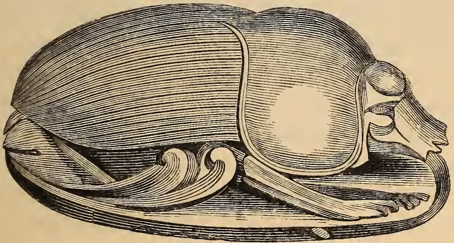
"A figure much larger than life: thus the Egyptians made the figure of this beetle so much larger than life, that a man can scarcely sit comfortably astride upon its back."

The children again expressed their pity for the ignorant Egyptians; but their father told them that they must reserve some of their pity for a great number of our fellow-Christians in this country, who make the noise produced by a small beetle the object of superstitious dread. "They believe that the ticking sound it makes is sent as a token or warning of approaching death; hence they call it the *death-watch*."

DEATH-WATCH BEETLE.

"Nurse told mamma that she heard the death-watch several times before aunt died," said Mary; "and when mamma explained to her that the noise was made by a little insect, she seemed quite offended."

"The ticking is indeed very much like that of a watch, and has a singular effect in the dead of the night, when all other sounds are hushed. I remember being once so much deceived by it as to remove some of the chimney ornaments, under the idea that a watch must have been inadvertently left behind them. But the insect has actually been seen at its work, tapping the wood-work of houses with its hard jaws, and eating its way through it. Therefore let no one persuade you that the ordinary labours of this little creature are an omen sent from God. Here is a picture of one of these insects, called the 'obstinate death-watch,' because when taken it remains motionless as if dead, and cannot be made to move. One kind of death-watch frequently infests stores of ship-biscuit, and does them much mischief; and others have been known to feed and multiply in a bottle of cayenne pepper, until it became a mass of insects in their several stages. Mr. Curtis, who has written a valuable work on insects, tells us this extraordinary fact from his own observation.



EGYPTIAN AMULET, REPRESENTING THE SACRED BEETLE.

CONVERSATION IX.

Insects.—*Straight-winged—Half-winged.*

The same day, as Henry was carrying a dish of filberts to his mamma, there crept out from among them a large earwig.* He immediately thought, "Is this a beetle?" and, as he could not see any wing-cases, he concluded it was not, although the shining, horny appearance of the creature reminded him of the beetles. On asking his papa, he found that earwigs were formerly considered to be beetles, but are now, by many naturalists, placed in another order, called *Orthoptera*, or "straight-winged;" from *orthos*, straight, and *pteron*, a wing.

"But I do not see any wings at all," said Henry.

"They are folded up in a very small space, and, in this stage of the insect's life, not being used, both wings and wing-covers are pressed down closely to the back. After the last moult, they are spread out, and are said to be very beautiful objects; but I have never been so fortunate as to see them fully expanded. Earwigs are so fond of hiding in dark places, that their habits are not very easily studied. They are known, however, to be great vegetable feeders, and to spoil the beauty of numerous flowers. They are particularly fond of feeding on the blossoms of the dahlia."

---

* Forficula.

EARWIG ON THE WING.

"Is it true," asked Robert, "that they creep into people's ears, and so get into their heads?"

"Certainly not. The poor insect has been named after this foolish notion; but it would avoid rather than choose such a place, on account of the bitter wax with which the ear is protected; and if one ever did enter the ear, it must have been quite by accident, as any other insect might happen to crawl into the ear of a sleeping person; and even then it could go no further, the structure of the ear being such as to make it quite impossible it should ever enter into the brain. Earwigs differ from most other insects in the care they take of their young. In most cases, insects die as soon as they have laid their eggs; but the earwig lives to take care of her brood. She sits patiently on her eggs and hatches them, after which she watches affectionately over her young ones, assembling them under her body, and keeping them there for hours together."

"Poor little creature!" said Mary, looking at the earwig, which was running across the table; "since you are such a kind mother I will not kill you, but will take you out into the garden, where you may perhaps find some of your relations or acquaintances."

"Another insect of this order is, perhaps, not very well known to you, but is a great pest in kitchens, especially in large towns. It is the cockroach,* a large, oval-shaped insect, a very rapid runner, and having the whole body of a fine glossy black, or of a very dark chestnut colour."

"I think I have seen it," said Henry; "for, when we were staying in London, I one day saw the cook with a curious box in her hand; it had sloping sides, and a hole at the top, with a glass funnel in it; and when I asked her the use of it, she said it was a beetle-trap, and that if I looked in, I should see some beetles which had been caught the night before. And there they were,—large, shining, black creatures, with long legs. I dare say these were cockroaches, though she called them beetles."

---

* Blatta.

"They were so; and I have no doubt, had you been allowed to go down into the kitchen at night, some time after the lights had been put out, you would have seen the floor quite blackened with these creatures. In many houses they come out in great numbers at night, eating up all crumbs or morsels of vegetable substance which they can find, but running off with great speed as soon as a light is brought into the room, or when daylight appears. Bakers are particularly annoyed by them, for they are great lovers of warmth, and therefore infest the neighbourhood of ovens to a great extent. Wherever much cooking is going on, persons are liable to be visited by these creatures."

"Why should not cockroaches and earwigs too be called beetles, since they are so much like them?" asked Robert.

"Because the covering of the body is not so firm as in the beetles, being rather leathery than horny; the wing-cases are also softer, the wings are folded in straight lines, instead of cross-wise, and the lower jaw is of a peculiar construction. There is also an important difference as to their changes. Although the insects of this order (orthopterous insects) go through the three changes we have spoken of, yet they do not alter their form so completely as the beetles: they are able to eat during the whole time, and you would scarcely know the difference between the early and later stages of this creature's life, except that they do not get perfect wings until after their last change."

"Then we shall never find the earwig or the cockroach in the form of a poor helpless chrysalis, unable to move."

"No; nor any other creature of this order, to which belongs also the curious insect called the Praying Mantis, of which I have a drawing."

"What a disagreeable looking creature!" exclaimed Mary. "Why is it called *praying* mantis?"

"Because it rears itself up on its hinder legs, and joins together its fore legs as people join their hands in prayer. But it is really a ferocious creature, and this is the attitude in which it waits for its prey, which consists of smaller insects, and sometimes of its own species. So warlike are several kinds of mantis, that Chinese children are

THE PRAYING MANTIS.

said to keep them in little bamboo cages for the purpose of watching the battles which take place among them, and which always end by the victors devouring the vanquished."

"Cruel little children!" said Mary; "they ought not to take pleasure in any thing of the sort."

"It is a barbarous pleasure which is derived from watching the sufferings of others; but it is one that is not confined to the children of heathen parents. Many children in this Christian land can find amusement in torturing animals, and in watching the painful effects of their cruelty. Nearly related to the praying mantis are the leaf insects, very curious creatures, so much resembling the leaves of trees, that it must be very difficult to distinguish them. I remember a beautiful specimen in the British Museum, with wings of a pale green colour, which bears the most exact likeness to tender foliage, while even the limbs look like twigs bearing smaller leaves or buds. These are foreign insects; but I have yet another example from this tribe, which is well known to you,—the merry little cricket,* that chirps on the hearth."

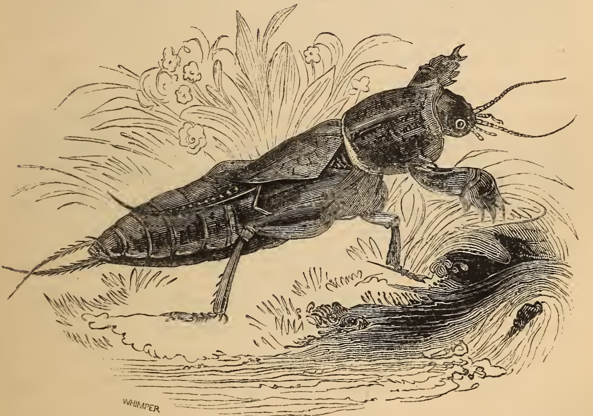
---

* Gryllus.

"I know it well," said Henry; "and I have seen it leap as well as heard it sing. It is very much like a grasshopper."

"It sometimes chirps in hedges as well as in kitchens," said Mary, "for I heard it one day singing very loudly on a sunny bank."

"That was not the house cricket, but the field cricket, which is of a different colour, and much less common. As to the singing you speak of, it



THE MOLE-CRICKET.

is produced not by the voice, but by rubbing the wings sharply against the wing-cases, which, in the male insect, have a little glassy membrane, acting like a tambourine. The females are silent. The house cricket feeds on crumbs of bread and other vegetable substances; the field cricket devours insects. There is another species, called the mole-cricket, from its habit of burrowing under ground. Akin to these insects are the locusts,* immense armies of which sometimes overrun eastern countries, eating up every green herb, and leaving the land behind them as a desolate wilderness. There is a striking description of the ravages of these creatures in the book of the prophet Joel (ii. 1-11), and there they are distinctly spoken of as instruments in the hand of the Lord, 'his great army,' employed to chastise the people for their iniquity."

"I have often wondered," said Mary, "what is meant by the locusts John the Baptist ate. They could not be these terrible creatures."

"Locusts are certainly terrible for their numbers, but they are vegetable feeders, and there is nothing to make them disgusting as an

---

[*] Acrydium.

article of food. Indeed, they are mentioned among the clean meats in Leviticus (xi. 22), and we have therefore no reason to doubt that they were actually eaten by St. John. In many parts of the east they are still eaten when bread is scarce, either ground into powder, and made into small cakes, or dried, salted, and boiled, when they appear red, like our shrimps, and are said to be not much unlike them in taste. Locusts, grasshoppers, and crickets, are all furnished with powerful hind legs, which enable them to perform vast leaps. The creatures I shall next speak of have this power in some of their families, although there is a great contrast in others."

"What are they, papa?"

"They are creatures whose wing-cases are half leathery and half transparent, and which are therefore called *Hemiptera*, from *hemisys*, half, and *pteron*, a wing. Perhaps you have noticed on the lavender bushes at home a quantity of white froth surrounding the stems."

"Do you mean what we call cuckoo-spittle?" said Robert. "I have seen that on a great many other plants besides the lavender."

"And I know what there is inside it," said Mary; "for one day I wiped off a little of the froth on purpose, and then I saw a little green insect, shaped like a very tiny frog, and when I touched it, it took—oh, such a leap!"

"I have no doubt it leaped two or three yards," said her father, "for it is among the most active of all leaping insects, when we compare its size with the space it clears at one bound. It is called the cuckoo-spit insect,* (appearing as it does when the cuckoo visits us,) and also the frog-hopper, from its shape and leap."

"It is a very odd creature to be able to make such a quantity of froth," said Robert. "I have watered the lavender in the morning till nearly all the froth is washed away, and before evening it is as thick as ever. What is the use of it?"

"It is not unlikely that its use may be to protect this very delicate insect from the heat of the sun, as well as from the view of its enemies. Within this frothy covering it also goes through its changes, which are not very marked, except by the gradual acquirement of wings, which adorn the perfect insect. There is no doubt that its wonderful leaping powers are bestowed as a means of escape, as well as to enable it to vault from plant to plant to procure food."

---

* Cercopis spumaria.

"I certainly did not expect to see the insect take such a jump," said Mary, "for it had not long leaping legs like the grasshopper."

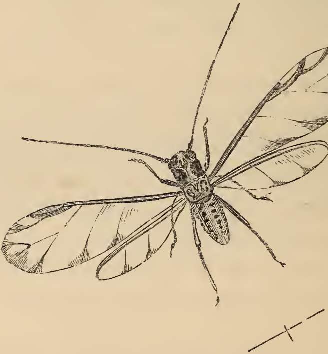
Her father told her, that the leaping apparatus in the group of insects to which this curious creature belongs, is different from that of most others, consisting of little coronets of short, thick spines, or spurs, on the legs. "There is another family of insects," he continued, "which is your mamma's great annoyance in the greenhouse, and which the older naturalists place in this order."

"I dare say you mean plant-lice, papa," said Mary, "for I have often seen mamma using a little brush to get them off the geraniums. And last summer, mamma told me I might bring as many lady-birds as I liked into the greenhouse, because their young are great enemies of plant-lice."

"*Aphides*, or plant-lice," said her father, "are a very numerous race, and destructive to almost every kind of plant. By wounding the tender leaves and shoots, and sucking their juices, they cause a wrinkled and distorted appearance, and soon make the tree sickly."

"What is the reason that the plants feel so gummy when aphides are on them?" asked Henry.

"Because these creatures shed a honey-like substance on the leaves, called *honey-dew*, of which ants are excessively fond. There are aphides peculiar to the lime-tree, and to the oak, which is often severely injured by their attacks, also to the rose, and to the hop. The latter is so destructive in some years as greatly to affect the revenue, or income of the country.



LIME-TREE APHIS.

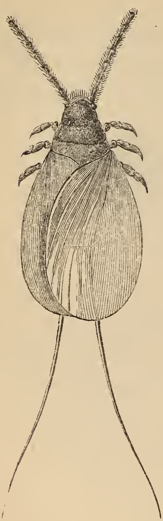
(The lines under the figure show the actual size.)

"How is that?" asked Henry.

"There is a duty paid to government on hops, and when the crop is good it produces a very large sum; but when the crop fails, of course the sum is very much lessened. Now, it is calculated that in the year 1825, owing to the attacks of these plant-lice and the almost total failure of the crop, the government lost in duty about four hundred and twenty thousand pounds!"

APHIS OF THE OAK.

The children were astonished to find that these little creatures could do so much mischief, and their father told them that the instrument with which the



MALE COCHINEAL INSECT.

aphides pierce the skin of plants, is a slender tube, or sucker, common to the insects of this order, and in some species used to pierce the skin of animals. "An instance of the latter kind," he said, "is to be found in a large family of insects called bugs, among which a disgusting creature, called the bed-bug, differs from the rest in being wingless. But, I fear," he added, "that you will think all the insects of this order more or less injurious, therefore I must mention the useful cochineal insect,* a native of America, from which we obtain the rich crimson dye called cochineal; the curious water-boatman,† which swims on its back, and extends its long legs at right angles with the body in the manner of oars; the tree-hoppers ‡ of the east, which on account of their song, or shrill chirping, were kept in cages by the Greeks, and celebrated by their poets; and the loud chirping lantern-flies of South America, so called because they have a transparent projection of the head like a lantern, but which has never been proved to be luminous. The mistake respecting these insects is supposed to have arisen from their being often mixed with the true fire-flies in the air, some of which are also called lantern-flies in the countries where they are common. Some of the families I have mentioned have been separated from hemipterous insects; but it has been more convenient to me to consider them under the old arrangement."

---

* Coccus. † Noctonecta. ‡ Cicada.

FEMALE.
COCHINEAL INSECT.

WATER-BOATMAN.

CONVERSATION X.

INSECTS.—*Net-winged—Membranous-winged.*

"WHAT were those beautiful insects that we saw hovering over the pond this summer, Robert?"

"Dragon-flies, papa, with large gauzy wings and bright blue bodies; and you told us they were watching for small insects, and that they darted about in that odd way in order to catch them."

"True; these insects will give you a good idea of a whole order called *Neuroptera*, or net-winged, from *neuron* a nerve, and *pteron* a wing. They have four wings of nearly equal size and texture, the nerves or veins of which cross each other so as to form a net-work of great delicacy and beauty. In most of the insects the wings are as transparent as those of the dragon-fly; but in some, the fore pair is thicker than the hind pair, and hides them when at rest."

"Dragon-flies are elegant creatures," said Mary, "and I cannot think why they should be called by such an ugly name."

"The French have certainly given them a more complimentary title," said her father, "for they call them *demoiselles*; but it is probable that our naturalists were thinking of the larva state of these creatures when they bestowed upon them their formidable name."

"What is the larva like?" asked Henry.

"I can scarcely tell you what it is like, but it is certainly most unlike the perfect insect, being as ugly as that is beautiful, and having its head enveloped in a strange uncouth mask."

"A mask!" said Mary; "then it has more right to the name of larva than even the other insects, for you told us that 'larva' means 'mask.'"

"I hope to show you this extraordinary mask in the spring," continued her father, "when these creatures may be found in almost every ditch, being aquatic in their habits; but for the present I cannot give you a better idea of it than by allowing Henry to read the amusing description given by Messrs. Kirby and Spence."

The passage was accordingly pointed out to Henry, and he read as follows:—

"Conceive your under lip to be bony instead of fleshy, and to be elongated downwards, so as to wrap over your chin and extend to its bottom; that this elongation is then expanded into a triangular convex plate, attached to it by a joint, so as to bend upwards again, and fold over the face as high as the nose, concealing not only the chin and the first-mentioned elongation, but also the mouth and part of the cheeks: conceive, moreover, that to the end of the last-mentioned plate are fixed two other convex ones so broad as to cover the whole nose and temples; that these can open at pleasure transversely, like a pair of jaws, so as to expose the nose and mouth, and that their inner edges, where they meet, are cut into numerous sharp teeth and spines, or armed with one or more long and sharp claws;—you will then have as accurate an idea as my powers of description can give of the strange conformation of the under lip of the larvæ of the tribes of *Libellulina* (dragonflies), which conceals the mouth and face precisely as I have supposed a similar construction of your lip would do yours. You will probably admit that your own visage would present an appearance not very engaging while concealed by such a mask: but it would strike still more awe into the spectators were they to see you first open the two upper jaw-like plates, which would project from your temples like the blinders of a horse; and next, having by means of the joint at your chin let down the whole apparatus, and uncovered your face, employ them in seizing any food that presented itself, and conveying it to your mouth."

The children were so much pleased with this droll comparison of the mask of the insect with the lip of a human being, that they would gladly have heard the whole history of the dragon-flies out of that interesting book; but their father told them that the pleasure must be reserved to a future day, for if they lingered too long in one place, he should never be able to conduct them through the vast ranks of beings that yet remained to be noticed in his general sketch of the animal kingdom. "If I give you one or two striking marks," said he—"such as this wonderful mask, which will fix in your minds the idea of a particular family, you must be contented to wait a little longer for a complete history of the individuals and their habits."

"Please, papa," said Robert, "just to tell us the use of this strange mask?"

"It is used to seize the prey unawares, for these larvæ cannot move very rapidly, but steal upon their prey step by step, and suddenly catch them in this machine as in a trap."

"Are there any more remarkable creatures among the net-winged insects?" asked Henry.

"More than I can dwell upon," said his father. "There are the day-flies,* which exist in the perfect state only a few hours: there is the curious ant-lion,† an insect which in the larva state lies watching at the bottom of a funnel-shaped hole in the sand until an ant misses her footing and falls to the bottom of the den, and so becomes its prey: there are the caddis-worms,‡ which as you well know cover their bodies with bits of stick, or stone, or straw, till they look like inanimate substances, unless they happen to put forth their head and six legs, and so crawl about the bottom of the pool which they inhabit."

---

* Ephemera. † Myrmeleon. ‡ Phryganea.

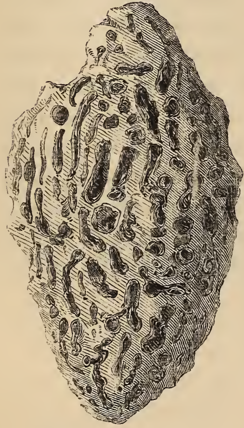
" Is the caddis-worm only the larva of some fly, or is it a perfect insect?" inquired Henry.

" It is the larva, and when it is about to go through its two remaining changes, it seals up the mouth of its tube with a net-work of silk, and there passes through the next stage of its existence, until the time arrives for it to appear as a fly. The insect then crawls to land and remains until the sun dries its skin, which then bursts and reveals a brown-winged fly, such as you may have seen flitting over the water in the summer evenings. Of all the creatures included within this order, however, there is none so celebrated as the White Ant of tropical countries."

WHITE ANT. (*Termes*

" Those are the insects that destroy furniture and books," said Henry.

" Yes, and almost every thing else that comes in their way, for they even corrode metals by the secretions from their bodies ; and as to the timber of which houses are built, it is sometimes completely eaten up by them. A friend of mine tells me that so secretly do these creatures carry on their work of destruction, that in walking through the woods he has sometimes placed his foot on the trunk of a large tree, which had fallen to the ground, and which had every appearance of being solid timber; but he has been startled to find it a mere shell, which gave way under his tread, being completely hollowed out by these voracious creatures. There is a full history of these insects in the little book I gave Mary yesterday, and which you may read at your leisure. But I must now turn to the next order, called *Hymenoptera* or membranous-winged, from *hymen*, membrane, and *pteron*, a wing."



CELLS OF WHITE ANT.

"Are there any interesting creatures in that order?" said Mary.

"Very interesting; especially to little girls that are fond of honey, for here we find the hive-bee,* whose history alone would fill a volume. The insects of this order, like the last, have four naked transparent wings, but the veins are fewer and are not netted, and the insects are provided with a slender tube, which in some cases is merely used to deposit their eggs, but in other cases is connected with a poison-bag, and forms a venomous sting."

WORKER-BEE.

"Ah, then I dare say the wasps and hornets belong to this order," said Mary.

"They do; and also the more innocent humble-bees,† and the common ants or emmets."

"But emmets have no wings, have they, papa?" said Robert.

"The males and females are provided with

HUMBLE-BEE.

---

* Apis.

† Bombus.

wings when they first appear, and make use of them in migrating to form a fresh colony, but the wings are afterwards cast off when no longer required. An insect called the ichneumon employs the egg-tube I have spoken of in a very singular manner."

ANTS ABOUT TO MIGRATE.

"What does it do?" asked Robert.

"It pierces the skin of caterpillars, chiefly those of butterflies and moths, and deposits an egg there."

"What a strange thing to do! Does the egg come to life?"

"Yes. The grub feeds on the fat of the caterpillar, without touching the vital parts, until it is full-grown, when the caterpillar is generally so much injured that it is unable to go through its changes."

Henry thought this account so extraordinary, that he wished to know whether his papa had ever seen the ichneumon attack a caterpillar, or whether he knew any one who had seen it. His papa told him that he had lately seen it himself for the first time, and under circumstances which made it impossible he should ever forget it. The children begged to know what those circumstances were, and their father answered:—

"During my late visit to Germany, I travelled through a part of the Thuringian forest, and came at last to the hill and castle of Wartburg, celebrated as having been the abode for ten months of Martin Luther, the leader of the Reformation. The ascent to the castle is by a steep winding path, and while I was toiling slowly up on foot, with my eyes fixed on the ground and my thoughts engaged with the idea that Luther had trodden that very soil, and had probably offered up many a prayer in these solitudes (which he called his

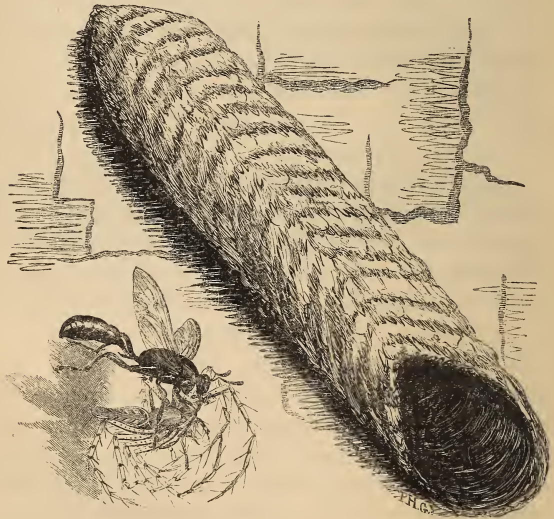
Patmos)—while I was thus occupied, I suddenly observed a hairy caterpillar on the path before me, moving along more rapidly than I had ever seen a caterpillar move before, and I soon discovered the cause, for immediately over it hovered a fly, which at that very instant settled on the back of the caterpillar and evidently pierced its skin, for the creature writhed with pain, curling sharply round from side to side, trying to get rid of its enemy. The fly left it, having doubtless deposited one egg under the skin, but in a moment afterwards returned, and was about to inflict a second wound on the poor caterpillar, which had renewed its rapid pace towards the bank, when I interfered and drove the ichneumon away, not being willing to see the operation repeated."

"Poor caterpillar!" said Mary; "I wonder what became of it!"

"It no sooner reached the bank than it buried itself in the long grass, and was completely hidden from view; but no doubt the injury inflicted by the fly must have caused its death at last. This habit of the ichneumon, though it seems a cruel one, is doubtless ordained for the good purpose of keeping in check the caterpillar tribes, which would otherwise do much greater injury to vegetation. There is another curious creature, called the burrowing wasp, whose habit it is to dig holes in the earth, and to place therein, as food for its young, the body of a spider, which has previously been stung sufficiently to prevent its escape, but not to kill it."

"It is quite fair that the spider should suffer in its turn," said Henry, "for it kills a number of flies and bees also."

"An American genus of these burrowing wasps," continued his father, "makes little nests of mud, and places them against the walls and ceiling in the interior of houses. These insects are called daubers, and their method of working is described by Mr. Gosse, from his own observation. It consists in bringing little pellets of clay about as large as peas, which the insect carries in her mouth, one after another, and which she spreads and arranges with her jaws, forming smooth and regular cells, in each of which she lays one egg and places from twelve to eighteen spiders, not killed, but rendered helpless. The grub goes through its changes in the dark cell, feeding on the bodies of the spiders, and at last eats its way through the mud walls of its dwelling to behold for the first time the light of day. Here is an engraving made from Mr. Gosse's drawing of the dauber and its nest."



THE DAUBER CARRYING A SPIDER TO ITS NEST.

CONVERSATION XI.

INSECTS.—*Scaly-winged.*

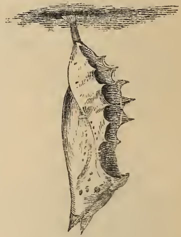
"I THINK papa must have told us about nearly all the insects," said Robert, "for he has been talking of them for several days past."

"Oh, no!" said Mary, "papa has not yet described any of the butterflies. Please, papa, to tell us the history of my beautiful favourites."

"I wish you had been with me this morning," replied her father, "for I have had the pleasure of looking over a large quarto volume, filled with coloured plates of butterflies, and descriptions of the different families. But although so large a work can be written on the subject, you must not expect from me more than a short and general account. The whole order consists of insects having four large wings, transparent in their own substance, but generally covered on both sides with a vast quantity of scales, or feathers, which overlap each other, and being richly coloured, produce the beautiful patterns we see on butterflies' wings. On this account they are called *lepidoptera*, or scaly-winged, from *lepis*, a scale, and *pteron*, a wing."

The children were surprised to hear this, for they thought it was meal or dust that covered these wings, and came off so easily on the fingers. Their father promised to show them under the microscope the beautiful structure of a butterfly's wing, and also the remarkable shape of the lower jaw.

"Instead of being prolonged," he continued, "as in the larva of the dragon-fly, into an uncouth mask, it is extended into two long and slender tubes, used to extract the juices of flowers. These tubes, when not in use, are rolled up in a spiral form. The larva state of butterflies you are well acquainted with, for nearly all the caterpillars you find in the garden are those of butterflies or moths. The chrysalis, too, is very familiar, being, in many cases, suspended, without any covering, by a little silken cord, to which is sometimes added a girdle of silk, passing round the body. It is only when the creature is thus motionless that it is properly called a chry-

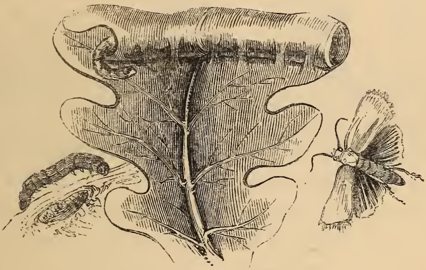


CHRYSALIS.

salis; in some of the other tribes, you remember, the insect continues to eat and move about during this stage of its existence: it is then called, not a chrysalis, but a *pupa*."

"I have a chrysalis at home," said Henry, "exactly like the picture papa has just shown us. I shut up a caterpillar in a box, with plenty of air-holes in it, and after a day or two I could not find the caterpillar, and thought it had escaped, until I saw, on the under part of the lid of the box, this chrysalis, hanging by some silk."

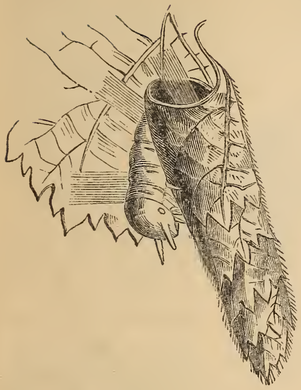
"It is very interesting to watch the various caterpillars," said his father, "and their manner of undergoing their changes. Some of them roll up



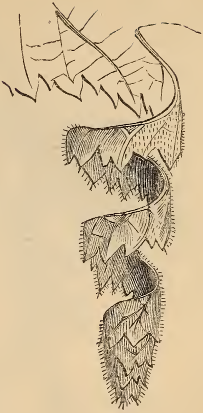
LEAF-ROLLING CATERPILLAR.

the leaf of a tree as a place of shelter; others fold and fasten leaves together, and then suspend them to a branch by a strong silken thread. Others actually cut out a long strip of leaf, and wind it up into a spiral nest, strengthened and held together with silk. The variety in their chrysalis state is also interesting. While numbers remain uncovered, others bury themselves in the earth, and others, again, especially among the moths, make an oval cocoon of silk."

LEAF NESTS.



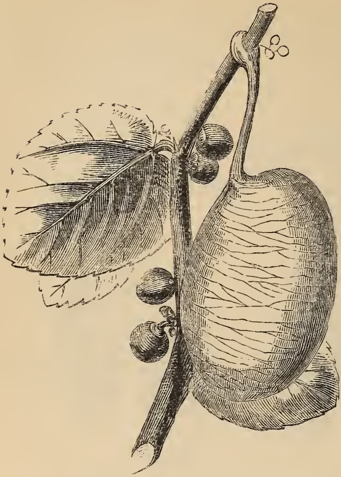
LEAF-CUTTING CATERPILLAR.



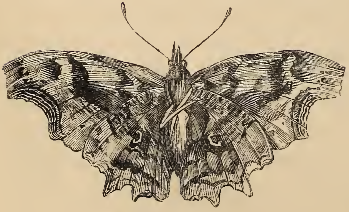
LEAF-CUTTER'S NEST UNWOUND.

"My silkworms are moths, are they not?" said Mary.

"They are; and so are the curious Tusseh silkworms of Bengal, which form a still more regular and beautiful cocoon. A convenient way of dividing the numerous families in this order (*Lepidoptera*) is by arranging them in three great divisions: the butterflies, which are most active in the day (*Diurna*); the hawk-moths,



COCOON OF TUSSEH SILKWORM.



COMMA BUTTERFLY.

which come out in the twilight (*Crepuscularia*), and the moths, which prefer the night (*Nocturna*). One of the families of butterflies you know best is that* which contains the common tortoise - shells, the beautiful peacock, and the comma butterfly.

"Dear papa, what is the comma?" said Mary.

"It is a butterfly with wings more deeply notched than usual, and with a white mark on the under side of each hind wing, resembling the letter C. To this family also belongs the admirable, with rich scarlet bands on velvet black. Then there are the pretty fritillaries,* marked with black or orange, and having silvery spots on the under part of the wing; the common dull-coloured butterflies† of our woods and meadows; the bright azure butterflies ‡ of the downs; and, above all, the famous purple emperor.§ Nor must we forget our common white butterflies,‖ or the numerous yellows.¶ These are all very interesting and beautiful creatures, having, as you well know, a zig-zag and unsteady

---

* Vanessa.

WHITE HAWTHORN BUTTERFLY.

CLOUDED YELLOW BUTTERFLY.

---

* Argynnis.
† Satyrus.
‡ Polyonimatus.
§ Nymphalis iris.
‖ Pieris.
¶ Colias.

flight, which is occasioned by the multitude of tiny plumes on the wings, but which is doubtless an advantage to the insect, making it more difficult of capture by birds. You will be astonished when I tell you the number of these feathery scales."

"Has some one had the patience to count them?" asked Henry, in a tone of surprise.

"Yes. Lewenhoeck reckoned the number of scales on the silkworm moth, and found that they amounted to about two hundred thousand on each wing."

"How very wonderful!" said Mary. "I had no idea my moths could boast of such a plumage. I shall be quite curious to look at them through a microscope next year."

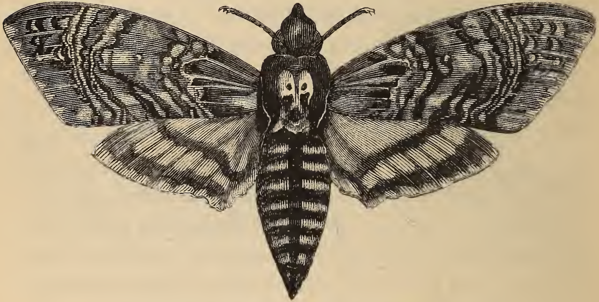
"Beautiful as our English butterflies are," said her father, "they are not to be compared with some of the foreign species for size and brilliancy of colouring. Some of the South American butterflies are quite dazzling to the sight from their great lustre, and others from the Eastern Archipelago are exceedingly rich. One of the latter, the Priam butterfly, is a splendid insect, measuring seven or eight inches in extent of wing, and being coloured rich green, and deep black."

"The moths are much less beautiful, are they not, papa?" asked Henry.

"They are more sober in their colouring, but many of them are very handsomely marked. You might know them from the butterflies, even were they to appear at the same time, for moths do not erect their wings, so as to make them meet above the body as butterflies do; nor are they so slender and elegant in their shape. The hawk-moths are very large and vigorous insects, and move through the air something after the manner of a hawk, whence their name. Although these insects are considered to belong to the twilight, yet they may be often seen enjoying the sunshine early in the morning and late in the afternoon. The humming-bird moth, in particular, takes advantage of sunny weather to make its excursions, and penetrate the tubes of larkspur and other flowers, probing to the very bottom in search of its sweet food. It is able to do this by means of its very long spiral tube, or tongue; and all the time it poises itself on its rapidly vibrating wings, in the same way as the humming-bird."

"I think I have seen it," said Mary, "if it is a brown and orange moth, with black bars on its wings."

" It is ; but those colours are somewhat common in moths. There is a magnificent species, twice the size of this, called the death's-head moth, which is also brown and orange, but differently marked."



THE DEATH'S-HEAD MOTH. (*Acherontia atropos.*)

" Why is it called death's-head ?" asked Robert.

" Because there is a mark something like a skull on the back of the insect, just between the wings. This singular mark has caused the poor moth to be dreaded by ignorant persons, as if it were a token of some evil happening to them. They forget that it is our own fancy which has converted these markings into a skull, just as we imagine the letter

C to be imprinted on the wings of the comma butterfly, and other letters on other species."

"I suppose the moth has no means of hurting any one?" said Mary.

"None whatever; and it is only surprising that bees, with their powerful stings, are so much afraid of this insect, as to suffer it to plunder them of their honey. Simply by its size and courage it is able to drive away the bees from their comb, and feed on the stores."

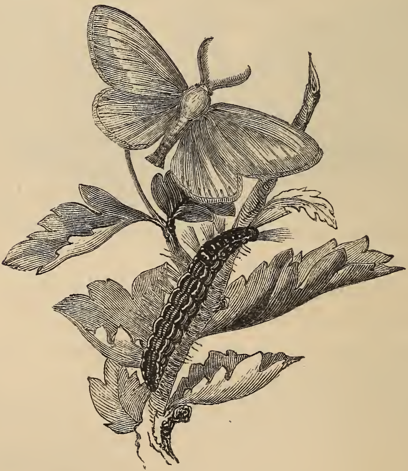
"I thought bees were wiser," said Mary, "than to be frightened without any cause."

"If men and women are so foolish as to be afraid of the moth," said Henry, "we need not wonder that little insects are."

"The death's-head moth," said his father, "has the curious faculty of producing a shrill cry like that of a mouse, which has, no doubt, helped to make it an object of superstitious dread. How it does this, I cannot tell you, for it is not considered that any insect is possessed of a voice."

"Do the true moths never come out except at night?" asked Henry.

"Some few of them may be seen in the afternoon, but the great majority of them deserve their name (*Nocturna*), by appearing only during the night. Your silkworms belong to a family called *Bombyx*, in this division of insects, and so does also the little moth of which I have here a representation, and which is very common on fruit and other trees. You may often see the caterpillar of this moth on the twigs of the hawthorn. Another



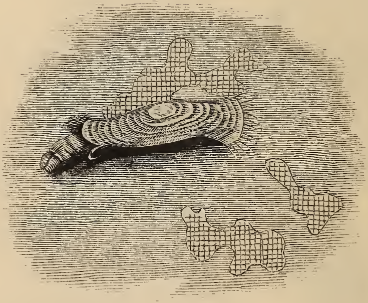
YELLOW-TAILED MOTH.

species belonging to the same family also infests that tree, and sometimes in great numbers. This is the brown-tailed moth, which, were it not kept in check by the ichneumon and other enemies, might become a serious injury to vegetation."

"I know that clothes moths do a great deal of mischief in houses," said Henry, "for mamma

BROWN-TAILED MOTH.

showed me the drawing-room bell-ropes one day, which had been quite spoiled by them. The insects had eaten the worsted which was twisted in with the silk, and so had made the bell-ropes come apart. And mamma said that she had also discovered the insects in a drawer, only just in time to save a suit of clothes, which they were beginning to attack."



LARVA OF CLOTHES MOTH IN ITS CASE. (*Magnified.*

"The different species of clothes moth," said his father, "are very numerous and destructive, for their larvæ feed on wool, hair, and feathers, and make a covering for their bodies out of the same material. The active measures taken by your mamma soon checked the evil in our house: but where the insect establishes itself unobserved it commits sad ravages. I will read to you what Mr. Curtis, the entomologist, says of the manner in which these insects once accumulated in his dwelling:—"I have been compelled to forego carpets in my chambers, from the devastations these little animals made; they were revelling in multitudes under my feet in the day, and flying about my candles by night; and lately I found that myriads had established themselves under the sofa-covers, where they luxuriated on the worsted knots that held the cushions together: they even attacked the small portion of feather on my pens, and my painting-brushes were frequently eaten up by them. This, however, I soon remedied by dipping them into spirits of turpentine, which is certain death to all insects. Cushions, &c. that are infected may be cured by moderate baking. I have observed, when any clothes have been attacked, that the moths invariably prefer the black suits; and so rapid are their operations, that I have found a caterpillar, half-grown, on removing a coat which I had worn a fortnight before."

"What can people do to prevent them from being so mischievous?" asked Mary.

"I know of nothing better," said her father, "than what Mr. Curtis recommends; namely, light, the clothes-brush, and the cane."

"What has light to do with it?" asked Robert.

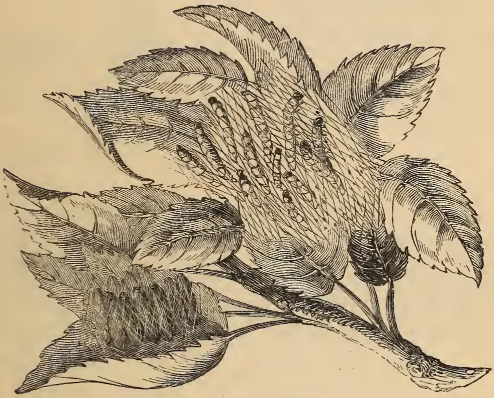
"A great deal; for you must remember that moths are creatures of the night, and prefer darkness; they therefore carry on their work in drawers and closets, and darkened rooms. By often brushing, beating, and exposing to the light all furs and woollen articles that are in danger from them, there is little fear that they will multiply in a house. But this caution must be observed in the kitchen as well as the parlour, for I remember once having the house stocked with moths from a piece of old carpeting which the servants had laid aside in a dark closet under the kitchen staircase. In the case of these moths, as well as others, the mischief is done by the caterpillar or grub. We have an instance of this on the apple-tree."

"Are apple-trees ever moth-eaten?" asked Mary.

"They are often injured by the small ermine moth, which lays its eggs on the twigs. When

ERMINE MOTH.

the grubs come forth, they eat their way into the substance of the young leaves, and feed between the upper and under surface. At last they appear on the outside under the protection of a common web, feeding in company until the time arrives for their change, when each spins a little white cocoon, and becomes a chrysalis. Another moth that is very annoying to the gardener, is the codlin moth, which lays its egg in the eye of



GRUBS OF ERMINE MOTH.

the apple. The caterpillar afterwards eats its way into the fruit, avoiding the vital part or core till it is nearly full-grown, when it attacks the pips. The apple at length falls to the ground, and the grub makes its escape, crawling up the stem of a neighbouring tree, and finding a dwelling in the bark, where it spins a white cocoon."

CODLIN MOTH AND CATERPILLAR.

"I have sometimes seen a very beautiful little moth on our garden-wall," said Robert, "with wings just like a fan."

"No doubt it was one of the plume moths,"* said his father, "a family of small, but exceedingly beautiful creatures, whose wings are divided into two or three slender fringed plumes. Perhaps that you saw was the six-cleft plume moth, a most elegant little insect. In the case of moths, as well as butterflies, the foreign species are larger and more striking than our own. The great atlas moth of China, when its wings are fully expanded, measures nearly a foot across."

---

* Pterophorus.

CONVERSATION XII.

INSECTS.—*Two-winged.—Wingless.*

CONTINUED rain having confined the children to the house during a whole morning, they all became much at a loss how to employ themselves. "If we were at home," said Henry, "there would be plenty of things to do; but here, in lodgings, without our books and puzzles, I really do not know how we shall get through the day."

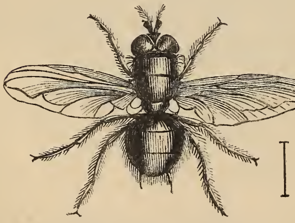
So saying, he went to the window for perhaps the twentieth time that morning, and looked up at the clouds to see if there was any hope of a change for the better.

"From the appearance of the sea and of the sky," said his father, "I think we must make up our minds to a settled wet day. Instead, therefore, of watching the clouds with that disconsolate face, turn your eyes and thoughts to the little insect that is buzzing on the window-pane almost close to your cheek."

Henry looked down with something like contempt at a common house-fly, which made a faint humming noise against the glass, as it flew about with languid and enfeebled wings, already half paralysed with the cold of approaching winter.

The younger children, glad of anything that promised amusement on such a dreary day, begged their father to tell them the history of the house fly.

" It is a good example," said he, " of insects called *Diptera*, or two-winged; from *duo*, two, and *pteron*, a wing. The gnats belong to this order, and the crane-flies, or " long-legs," and so do all those troublesome flies which annoy and injure cattle."



DOMESTIC FLY (*magnified.*)

" The forest flies, I suppose, that teaze the pony so much," said Robert.

" Yes, and the gad-flies, that make horses, and cows, and deer, rush about so madly in hot weather.* These persevering insects pursue and hover over the poor animals until they can find an opportunity of fixing on them, and laying their eggs. There are different kinds of these creatures, peculiar to different animals. There is also a very destructive fly which lays its eggs in the stem of the wheat plant."

---

* See p. 150.

"House flies are not mischievous, are they, papa?" asked Mary, looking at the insect in the window.

"Not at all; and even of those flies we call mischievous, there are many that are of great use in nature, whatever inconvenience they may cause us."

WHEAT-STEM FLY (*magnified*).

"Can the disagreeable flesh flies be of use, papa, that cook is so anxious to keep out of the larder?"

"The whole race of flies may be considered as scavengers, employed to get rid of decaying substances, both animal and vegetable. They are also of great importance as forming the food of birds, which destroy myriads of flies every season. And though it is disgusting enough to see the larvæ, or maggots, of the flesh fly attacking meat, yet we must remember the use there is in creatures which are able to consume flesh so rapidly; for when the carcase of an animal lies exposed, it soon makes the air very unwholesome, and this would often happen, were it not for insect scavengers of various sorts. The way in which these creatures multiply, and the rate at which they feed, must be truly remarkable, for Linnæus once expressed his belief that three flesh flies would destroy a dead horse as quickly as a lion could do."

"If Linnæus believed it himself, I do not think he would make any one else believe it," said Henry.

"At first sight it appears a gross exaggeration, but when we come to consider that the lion is a considerable time tearing and crushing his food, (as you may see some day, at the Zoological Gardens), and that after a full meal he sleeps many hours before he is ready to return to his repast; and when we learn on the other hand that each flesh fly in two or three days produces a vast multitude of larvæ, said to be not less than twenty thousand, it is then not quite so incredible, that the young of three flies, amounting to perhaps sixty thousand voracious creatures, should destroy all the flesh of a carcase as quickly as the king of beasts could destroy both flesh and bones, which was doubtless the meaning of Linnæus."

"At that rate," said Mary, "I wonder all our meat is not eaten up by them; I am sure I have seen more than three flesh flies in the house at once."

"But you never saw the cook leave them undisturbed upon her meat for one minute, much less for two or three days; therefore they have little opportunity of doing us mischief. Besides, these insects prefer decaying flesh to wholesome meat, knowing that it is more suitable food for their young."

"I am glad house flies have not these unpleasant habits," said Mary; "I have often noticed that they seem fond of nice things, such as fruit and sweetmeats."

"And what thirsty creatures they are!" said Robert. "I like to watch them sucking up milk or syrup with their little trunks."

"The insect may be fond of nice things, as you say, and yet it may choose a disagreeable place to lay its eggs in. Our house fly lays its eggs in the dung of stables, and hot-beds, and there the larvæ are nourished. It is said, but I know not with how much truth, that house flies are unknown in Venice, because horses are not kept in that city."

"Here is a dead fly under the window," said Henry, and as he took it up and stretched out its wings, he was surprised to find that there were two other tiny wings behind the first pair. His father told him that many of these two-winged insects have what are called winglets, which are supposed to balance the body during flight.

"They have also," he added, "two organs called *balancers* or *poisers*, which appear to answer a similar purpose, for when a poiser or a winglet is cut off, the flight of the insect is awkward and unsteady. Where the winglets are large the poisers are very small, as being less necessary; but when the winglets are very small or absent, these poisers are long and conspicuous. They are very pretty objects in the long-legged crane-flies, and appear like little clubs extended one on each side the body, behind the wings. I doubt whether you will see them at all on that little fly without the microscope."

"Why are flies so much more troublesome in the latter part of the summer than at the beginning?" asked Mary.

"Because at the close of summer the nights are getting too cold for them, and they therefore crowd into houses for shelter. Our annoyance in this respect is small compared with that of people in warmer countries. Flies are very tormenting in Spain, Italy, and the olive districts of France. A traveller in those countries tells us that it is not that they bite, sting or hurt; but they buzz, teaze, and worry, so that the mouth, eyes, ears, and nose are filled with them. They also swarm on fruit, milk, sugar, and every kind of provisions, in such myriads that unless constantly driven away by a person who has nothing else to do, to eat a meal is impossible."

"I wonder people do not try the plan mamma was telling us about," said Robert, "and make nets for all their windows. They might make them of thread, or of very fine twine, and the flies would not go through."

"That curious fact does not seem to be much known, although it has been tried with success in Italy, and also in England. Dr. Stanley, Bishop of Norwich, caused such nets to be placed against his windows, and was in consequence able to enjoy the air all the summer without the intrusion of flies. They sometimes settled on the meshes of the net, and he heard them buzzing outside, but none dared to enter. The meshes were large, and it is difficult to explain why the flies did not go through."

"I will ask mamma to let me make nets for our windows," said Mary, "before the warm weather comes again."

"Our poor fly is getting quite lively," said Robert, "it has flown from the window to the ceiling, and is walking along with its head downwards. How is it that flies can do this, papa?"

"Because their feet are provided with little suckers, which hold fast on smooth surfaces, and prevent their falling, just as the leech is provided with large suckers for the same purpose. There are two of these suckers on each foot, and you may see them with a common microscope, by looking at a fly as it walks on the inside of a glass tumbler. Lately, it has been thought by some persons, that the foot of the fly is provided with tubes, and that the insect sheds a gummy substance through these tubes, which attaches it to the surface; but I fully believe that the first and general opinion is the right one. Presently you shall look at the fly's feet through a microscope;

but I will now conclude my description of insects by mentioning three small orders that are wingless, namely, fleas, whose powers of leaping are very remarkable; lice, which were employed as one of the plagues of Egypt; and a tribe of small, scaly, silvery-looking insects, (*Lepisma*,) sometimes seen amongst old books and papers, with long bristles at their tails.

" What a variety there is in insects," said Henry, " if these tiny creatures are related to the beautiful butterflies and chafers !"

" The variety is indeed astonishing; but, as a general rule, insects are distinguished by having, in their perfect state, six legs, and by the body being divided into three distinct parts,—the head, chest, and abdomen, which are often united only by a very slender stem, as in the wasp. It is from the body being thus deeply cut into *sections* that we get the word *insect*. The change of an insect from the state of an apparently lifeless chrysalis to that of a perfect and beautiful being, was not overlooked by the naturalists of ancient days. At a very early period, it was viewed as a type of a happy resurrection; nor shall we go wrong by taking the same view of the matter, especially if we consider the whole life of the insect, and see how carefully it prepares for the tomb (the state of the buried chrysalis). While considering its industry, patience, and watchfulness, each one of us may well ask, Am I equally diligent in preparing for my great and infinitely more important change?"

GAD-FLIES WHICH TORMENT REIN-DEER.

CONVERSATION XIII.

SPIDERS.

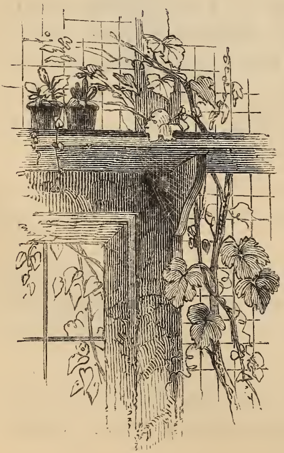
To the great disappointment of the little folks, the next day also proved stormy and unsettled, and they were only able to get out for a short time between the showers. Looking about, therefore, for some amusement within doors, Henry at last espied a little ball of beautiful pale yellow silk, about the size of a cherry, firmly fixed in the upper corner of the recess of the window, but on the outside. He pulled down the sash of the window, and mounted a chair, that he might look at it more closely; and he called Robert and Mary to see how nicely it was fitted in, and fastened to the wall by silken threads.

"I dare say it is the cocoon of some caterpillar," said Mary; "for it is very much like what my silkworms spin."

Henry thought it was too late in the season for any insect to be going through its changes, and he therefore referred to his papa to know what this ball really was.

"It is the nest of the garden spider," said his father; "and contains, no doubt, a great number of eggs. A friend of mine kept one of these nests all the winter, and early in the spring there came out ninety-six spiders, so small as to be mere black specks on the silken ball, and yet so perfect and active, that they immediately began to spin delicate little webs over the surface of the glass vessel in which they were confined."

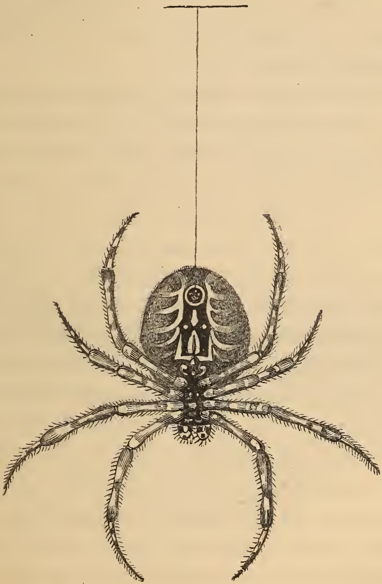
"May we take down this nest, and keep it, papa?" asked Robert.



"You had better leave it where it is. We have plenty of spiders in our own garden and greenhouse, and you will be sure to find one of these nests when we go home. And this reminds me that your mamma made a little sketch of a spider's nest, which was snugly placed under a shelf, close to our greenhouse door. Run and ask her if it is in the sketch-book she brought here."

Mary ran to find her mamma, and soon returned, showing the drawing represented in the preceding page.

"I dare say it is the cocoon of the very spider



LARGE GARDEN SPIDER. (*Epeira diadema.*)
(Natural size.)

we watched so long while it was making its web," said Henry. "There were two or three garden spiders in the greenhouse, and one of them was so large that we called him our 'prize spider;' and mamma allowed them to stay that we might see their beautiful webs, which are very different to house spiders' webs."

"Did you see the whole process of making the web from beginning to end?" asked his father.

"Yes, papa; and I will tell you how it was: the spider first made three long lines of silk in the shape of a triangle, and fastened them firmly at the three corners; two corners were fastened to opposite parts of the wood-work of the greenhouse, and the third corner to a tall spike of blossoms of mamma's large *salvia*, which was quite pulled out of shape by it. Then the spider began making a line across the triangle, which she did by fastening her silk to one side, and then walking along the triangle till she came to the place opposite, and as she walked the silk still came out of her spinners, and she held it away from the triangle with one of her feet until she was at the right spot to fasten it, and then she pulled it in to the right length, and made it very firm. When she had got this one line across, she very soon made others; and she had such a nice way of marking out the place where all the lines were to meet."

"What was that?"

"She put a little bit of white flossy silk in the middle of the line, and then, wherever she was, she could see where to come to. So she made a great many lines, all meeting at the white spot in the middle, and looking like the spokes of a wheel. After that, she began the prettiest part of her work, for she walked round and round, where all the spokes met, drawing her thread after her, and fastening it to every spoke. At first it was very easy work for her, because the spokes were so near together that she could easily step from one to another; but as she made larger and larger rounds, she could not step across, but was obliged to run down the spoke a little way and fasten her thread, and then come back again and walk along the line to the next spoke. I wondered very much why she made her outer rounds so wide apart as not to be able to reach from one to the other; but I saw the reason of it when she came to the last of them; for then, after waiting an instant to rest herself (poor thing!), she turned round, and went back again, spinning a new bright thread and filling up all those wide spaces. The old thread served her for a scaffolding, so that she got on much better going back."

"And how careful she was," said Mary, "to measure the distance between every round!—It was just the length of her leg between one round and another."

"That was at the outside," said Henry; "but she made it closer in the middle. Another very curious thing she always did just as she fastened her line to the spoke, and that was, she pressed her foot upon it, and stretched it a little to prevent its straining too tight. I think this helped to keep the web in its beautiful shape."

"How glad we were," said Robert, "when the spider had finished her work! We were so tired of standing, and yet we did not like to lose sight of her a minute; and she must have been tired too, for she settled down on the spot in the middle, and did not move for some time."

"And you thought it was all over," said Mary, "and went away to get your luncheon, and so you missed seeing a very curious sight; for, presently, the spider began biting off all the little threads that held the bit of floss silk in the middle, and then she rolled it up in a ball, leaving a small round place in the middle of the web without any lines at all in it."

"And what did she do with the ball of silk?"

"She seemed to gather it up under her body; but I suppose she must have been holding it in her mouth, for, while I was looking, a fly was caught in her web, and as she was running towards the fly she let fall the ball of silk. The fly struggled, and tore the new web, but the spider soon mended it again, though not very cleverly, for you could see where the joins were. She filled up the space in the middle, too, after a time, and made it all complete."

"No doubt, you saw how the fly was secured?" said her father.

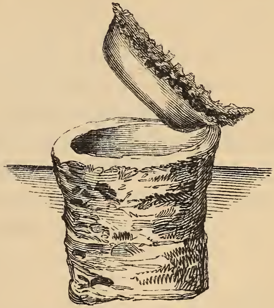
"Yes, papa; the spider rolled it up in silk till it could not move its legs or wings, and then left it, not being hungry, I suppose."

"On such occasions," said her father, "it is surprising to see the quantity of silk the spider can produce: instead of being a fine line it is a broad riband, in which the fly, or other insect, is swathed like a mummy. Our common garden-spider must serve to you as a specimen of a large number of spiders which spin net-like webs. That of the house spider is much closer, and resembles irregular weaving."

"Are there any spiders that do *not* make webs?" asked Henry.

MASON SPIDER.

"Yes, several. There is the little hunting-spider, which may be seen gliding along upon old walls; it manages to catch flies by darting suddenly upon them when at rest. There is the mason-spider, sometimes called the trap-door spider, because it makes a little house for itself, and closes it with a curious trap-door and hinge. This spider, also, makes no web to catch prey, although it spins abundance of silk for the lining of its nest, and for the formation of this door, which is made of layers of earth and silk firmly worked together. The water-spider, a very wonderful little creature, makes a sort of diving-bell of silk, which it moors by threads to aquatic plants, and remains in, watching for water-insects. All these spiders breathe by means of hollow sacs, the openings of which are on the under part of the body; but there is another spider, with very long legs and a small round body, which is placed in another order, because it breathes by air-pipes, having one opening on each side the body; this is the shepherd spider, or harvestman, so common in autumn."



NEST OF MASON SPIDER.

"There were plenty of them on our garden-wall when we cut down the creeping plants," said Henry; "and they were so exactly of the colour of the old bricks, that we should not have noticed them except for their long legs—five or six times longer than their bodies."

" In the same order with the shepherd spider," continued his father, " is the tick, a small creature, that is very troublesome to sheep and other animals; the mite, which is so small as to be nearly invisible without a microscope; and the little book-scorpion, often seen crawling backwards or sideways among old books, dried plants, or insect cabinets, yet not for the sake of these, but for the purpose of feeding on the minute insects that are found in such collections. The true scorpion ranges with spiders, though in appearance it is more like a lobster, on account of its broad claws, or pincers."

" Are there any scorpions in England ?" asked Mary.

" Fortunately for us, there are none. They are not natives of our temperate climate, but of hot countries, where they make formidable use of an exceedingly sharp, poisoned sting, with which the tail is furnished. These animals feed on beetles, locusts, and other insects, which they first sting to death. All these creatures were formerly classed with insects, but they are widely different in their formation and habits, and, indeed, are the great enemies of the insect race."

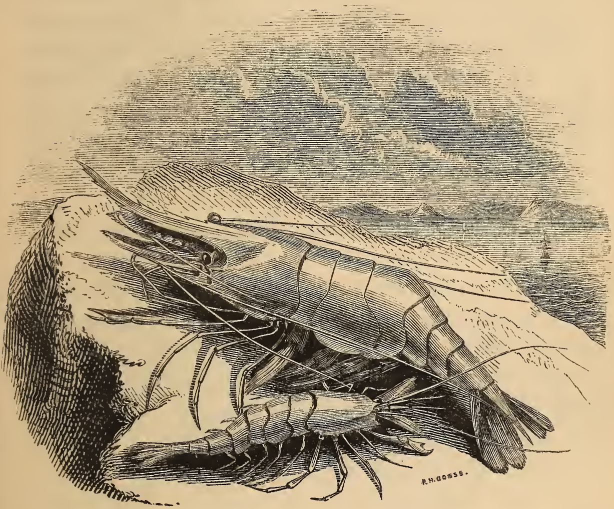
CONVERSATION XIV.

CRUSTACEOUS ANIMALS—(LOBSTERS, CRABS, ETC.)

The return of fine weather enabled the little party to resume their sea-side rambles; in the course of which they were sometimes amused by watching the shrimpers, still occasionally to be seen on the shore, although their busiest season had passed away. Their task was a very simple one, for they merely walked along in shallow water, pushing before them a wide net stretched out on a piece of wood, and fixed to the end of a pole. The edge of this net, scraping against the sand, disturbed great numbers of shrimps, which were easily caught in the net while endeavouring to escape. The children sometimes saw not only men and women, but little boys, no bigger than Henry, thus employed, and they were glad when they could find an opportunity of talking with them, and asking them about their trade.

One little boy told them that his father sometimes went out, with other fishermen, in a boat, to a sand-bank at some distance, where they caught plenty of shrimps. The way they managed was to throw out three or four nets, which were made to drag on the bottom by having leaden weights fastened to them. The little boy sometimes went too, and helped to boil the shrimps on board. When the shrimps were for their own town, they were boiled but a very few minutes, but when they were for the market at a distance, then they were boiled longer.

All this amused the children very much, and they wished they could see the shrimp-catchers in the spring, when their trade is at its height. Mary said she should not have guessed that those greyish-looking creatures in the shrimpers' nets were shrimps, such as she had seen at the fishmonger's, and she thought they were prettier after they had turned red in boiling. She did not see so much difference in prawns, for they were of a pale pink when alive, and much larger and prettier than shrimps. Her father showed her the sharp-projecting horn on the forehead of the prawn, pointed at the end, and having teeth on each side. "This weapon of defence against its enemies is sufficient to distinguish it from the shrimp, which is not so



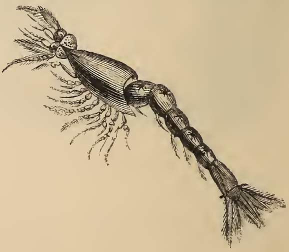
SHRIMP AND PRAWN. (*Crangon. Palæmon*).

provided. Shrimps swarm in most seas, prawns are less abundant; but both seem intended, by their Creator, to perform the same useful office in the waters that some insects do on land, namely, the clearing away of dead animal matter."

The children were not quite pleased at this, and wondered that creatures, feeding in that way, should be eaten, and taste so well. They were amused to hear that the shrimps of the North Seas, in their love of animal food, attacked joints of meat hung out from the sides of the ship by Captain Parry's crew, and in a few nights picked them to the bone.

"But how could such little creatures reach them?"

"The joints of meat were put into holes made in the ice, and were therefore under water, and within reach of these nimble creatures. This was done to preserve the meat unfrozen, and it was little expected that such havoc would be made by the shrimps. Here is a drawing of a curious little animal, called the opossum shrimp, because the



OPOSSUM SHRIMP.

female has a pouch, or bag, in which she carries her young. It is of a different family from the common shrimp, as you will easily imagine from its very different appearance."

Henry wished to know what tribe the shrimp and prawn belonged to; and he was told that these, together with lobsters, crabs, cray-fish, &c. are included in a large class of animals called *crustaceous*, on account of their thin shelly covering. "Wonderful is the power given to these creatures to renew their shells, and to creep out of the old ones when they have become too small!"

"Then, do lobsters and crabs throw off their shells every year, in the same way that birds throw off their old feathers, and horses and dogs their old coats of hair?" asked Henry.

"Only while they are growing," replied his father. "When they are come to their full size, this operation, which is a painful one, is no longer required; and from all we can learn, the same shell then serves the animal for the rest of its life, unless it meets with an accident, and loses one of its claws, when another sprouts forth to supply its place."

"How convenient it must be for these creatures, and for the hydra and star-fishes," said Henry, "to get a new leg or arm when they want one, and not be obliged to do without their limbs, as men sometimes are, unless they get false ones!"

"You have often noticed," said his father, "the claws of lobsters, which are armed with formidable pincers, but have you ever observed that one of these pincers is provided with knobs, while the other is toothed? This, it appears, is to enable the animal to hold firmly to marine plants with one claw, while with the other it divides its food."

"What are marine plants?" asked Robert.

"Plants growing in the sea; and lobsters, crabs, and shrimps, are marine animals, because they live in the sea. Lobsters run very nimbly under water; and when alarmed they make surprising leaps, moving as swiftly as a bird can fly. Great numbers are taken on our shores, but the chief supply of the London markets is said to be obtained from the deep rocky inlets of Norway. Nearly related to the lobster is a singular creature, commonly called the Hermit Crab; although it differs from crabs in several respects. This animal is only in part covered with a shell, and to protect the soft portion of its body it creeps into the deserted shell of some other animal, fits itself to the strange abode, and carries it about as comfortably as if it were its own."

HERMIT CRAB. (*Pagurus.*)

"What a droll creature!—and how I should like to see it!" said Mary.

"Here is a drawing of it, and we may also possibly see the original; for when the first shell becomes too tight, the hermit is seen busily searching on the shore among pebbles and shells for a more comfortable habitation. Many shells are turned over, examined, and even tried on, before the right one is found; but at last the little animal finally deserts its old home for a more roomy and convenient dwelling. Sometimes two hermits set their affections on the same shell, and there is then a battle to decide whose it shall be. This disposition to fight has given them the name of Soldier, which is quite opposed to the peaceable title of Hermit."

"I have seen several real crabs lately," said Robert, "and they all run sideways instead of straight forward. The little shrimper told me how to catch little crabs, that hide in holes in the rocks at low water. It is only to push in a hooked stick, and the crab is so angry that he catches hold of it tightly with his claws, and will not let it go till he is dragged out of the hole."

"And I know how large crabs are caught for the market," said Henry. "Crab-pots are set forty or fifty together, with bits of fish in them. They are made of wicker-like baskets, and are like a mouse-trap at the opening, so that a crab can get in, but he cannot get out again. Weights are put in them to make them stay at the bottom of the water, and there the silly crabs crawl in to eat the fish and are caught. Lobsters and prawns are sometimes found in the crab-pots along with the crabs. If not wanted for the market directly, they are put into boxes with holes in them, called *wells*, which are floated in water."

CRAB WITH OYSTERS. (*Cancer.*)

"That is a very convenient plan for keeping them," said his father, "and I understand they are brought alive even from Norway in wells towed after the vessel. Crabs are extremely numerous; for besides those which are so abundant on our shores, there are many families that inhabit the open sea and are not often seen elsewhere. Oysters sometimes attach themselves to the shells of crabs in their dwelling-place, in the manner above shown. Then, again, there are land crabs,* which only pay occasional visits to the sea."

"What sort of places do they live in?" said Henry. "We never see any."

"They live in burrows among the hills of tropical countries, and are very common in the warmer parts of America and in the West Indies. A species called the Violet Crab is very numerous, and migrates once a-year towards the coast. The animals travel in large companies by night, and so resolute are they in keeping their course, that they climb houses, fences, and everything that comes in their way. During these journeys they do much mischief in gardens by destroying the fruit, but they are also taken in great numbers at this time."

---

* Gecarcinus.

" What do they take these journeys for?" asked Robert.

" To lay their eggs or spawn in the sea. After this they return, finding their way back to the mountains in the same wonderful manner that they came, and burrowing as before in the earth. Other families of crabs, not so long absent from the sea, are the Horsemen, living on sandy shores near the mouths of rivers, and remarkably swift of foot; and the Calling Crab, which has one claw much larger than the other. This gives the animal a very odd appearance; but it turns out, as most other strange appearances do in nature, to be highly necessary and useful; for this large claw closes the entrance of the burrow, and is ready to seize passing prey, while another such would fill up the burrow uselessly. When moving along, the animal holds up the large claw, as if beckoning: this is why it is named the Calling Crab."

The children were amused by this account of the land crabs; but they were glad they did not live in the countries where they abound.

" I am afraid to touch one of the crabs on the shore," said Mary, " lest I should get a pinch from its claws; and if there were large crabs walking about the fields and gardens by night, I do not think I could sleep for fear of their getting into the house."

Her father told her that land crabs do enter houses in hot countries, and make a noise in their hiding places very much like rats, but they are harmless unless attacked. He also said that they feed voraciously on flesh when in a putrid state, and have even been known to penetrate graves.

"Dreadful creatures!" said Mary. "How is it possible any one can eat land crabs!"

"I do not know that the sea crabs are much better," said her father; "for no one can tell what may have been the nature of their repast beneath the waves. These crustaceous animals, you must remember, are all scavengers appointed for the removal of that which is falling to decay; and we must be thankful for this merciful provision made by our heavenly Father for the purity and healthfulness of the earth and seas. I have now brought you to the end of another great division of the animal world. It is called *Articulata,* from *articulus,* a joint; because one of the most conspicuous marks of this immense host of creatures is that they are composed of joints or rings."

"The worms and the caterpillars are full of joints," said Mary.

"And so are insects and spiders," said her father; "but the joints are so closely packed together that you only notice two or three marked divisions."

"Shrimps and prawns are jointed," said Henry, "and so are lobsters, but I should not have thought crabs were."

"In the crabs, indeed, we lose nearly all marks of these divisions in the broad shield which covers its body, and this leads the way to the tribe next above them.

"But let us pause an instant, and think what a vast multitude of living beings we have passed over in our little sketch of these articulate or jointed creatures,—walking, running, leaping, flying, swimming beings, countless as the stars, or as the sands upon the sea-shore, and yet every one, in earth, or air, or sea, constantly cared for and present to the eyes of the same merciful and gracious God, in whose sight we stand at this moment. Who can help exclaiming, 'Great is our God and greatly to be praised: let the whole earth be filled with His glory!' Amen."

Mary felt the tears come in her eyes, as her father said this, and she softly whispered, "Amen."

CONVERSATION XV.

MOLLUSKS—(SNAILS, ETC.)

The next day Henry was busily engaged in arranging his collection of shells, part of which were of his own finding, and part the gift of a gentleman residing near that coast, and whose large cabinet of foreign specimens the children had been permitted to see.

"How glad I shall be," said he, "when I know the names of all these shells, and something about the creatures that lived in them!"

"The creatures are called *Mollusks*," said his father, "because they have soft bodies, and there are a few whose names and histories I can give you at once; but first let us notice the shell itself. What a wonderful substance it is!"

"Is it different from the shells of lobsters and crabs?" asked Mary.

"Very different; theirs is not properly shell, but a hardening of the outer skin into a bony crust, which answers the purpose of a skeleton, the soft parts of the body being attached to it. The animals we are now speaking of, on the contrary, possess a thick skin, or membranous covering to their bodies, called a *mantle*, and this mantle has the astonishing property of producing at its edges the material of which shell is formed. When we reach home I will give you an opportunity of seeing how quickly a broken shell is mended by the animal that lives in it."

"Thank you, papa!" exclaimed the children, "we should like that very much; but where will you get the animal?"

"I shall not have to walk far to find a garden snail, and I can take away a piece of the shell without hurting the creature, because the flesh is not attached to it except at one point."

"I have often broken a snail-shell by accident," said Henry, "but I had no idea the creature could mend it again."

"By keeping a snail and watching its proceedings, we shall find that in twenty-four hours it will have made a covering almost as thin as a spider's web over the broken part. This it does by spreading out the substance which oozes from its mantle, and which is at first fluid, but hardens on being exposed to the air. In the course of a few days this web will have become much thicker by fresh layers spread over on the inside, until at last the new part is nearly as thick as the old."

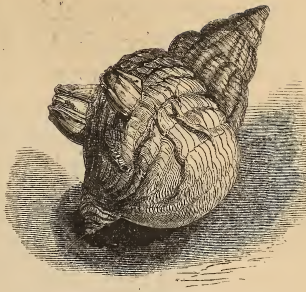
"I think I know which is the mantle in a snail," said Henry. "It must be the thick skin over the back which reaches down the sides, and looks puckered at the edge, except when the snail is stretched out at full length."

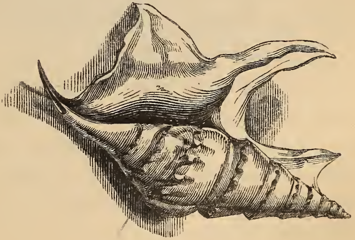
"Sometimes when I take a snail-shell off the wall," said Mary, "it sticks very hard, and there is no sign of the snail, for the hole is covered over with a thin plate that looks like gum."

"That is a sort of shutter which the snail makes when it chooses to retire into its shell. Being a great lover of moisture, it shuts itself up in this way during a very dry season, crawling out again as soon as rain returns. In winter it makes a thicker shutter of this kind, and also protects itself from cold by a curious retreat formed of mixed earth and slime. We shall be able to find some of these on the garden wall in November."

"Is not this a snail-shell?" said Henry, taking up a thin violet-coloured shell.

"The animal is called the Violet Snail, although it does not belong to the same order as the common snail. It is not formed for crawling, but for swimming in the sea, where it is seen in large companies and is phosphorescent by night. When alarmed, it discharges a blue fluid which colours the water, and helps to hide it from its enemies. Birds are very fond of these snails, and carry them off with great dexterity. These spiral shells are the Rock Shell, Periwinkle, and Whelk, belonging to the same order. Here also is the Limpet, with its conical cup, which sticks so fast to the rocks, and this is the Pelican's - Foot Strombus, with its curious sharp projections. I see you have also a Tiger Cowry, with its bright polished shell."


WHELK.

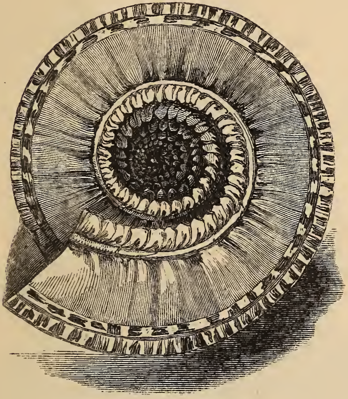

PELICAN'S-FOOT STROMBUS.

"Is it not wonderful, papa, that shells should be so beautifully marked and spotted? I cannot think where the colour comes from."

"The animal bears the colour in little glands on the surface of the mantle, so that it is able to paint its own shell while making it. Wherever the coloured glands are placed, the shell becomes tinged of the same hue; but after the outer layers are painted, the supply of colour seems to be exhausted or withheld, for the inside of most shells is of a pearly tint, without any markings. The beautiful spots on this tiger cowry were thus produced, and so were the lines on the Harp Shell, and the delicate markings of the Cloth-of-Gold Cone. A tiny species of cowry, commonly called the Blackamoor's Tooth, is used as money in Africa and some parts of the East."

"What was that shell we saw the other day, which you said was like a spiral staircase, papa?" asked Mary.

"It is a foreign shell of great beauty called the Staircase Trochus, and is remarkable not only for its perfect spiral, but for the great regularity of the markings. Another beautiful shell, once extremely rare and valuable, is also compared to a staircase, from its spiral form and regular ridges or steps. It is the Wentletrap, for which formerly twenty or thirty pounds was not thought too high a price.



STAIRCASE TROCHUS.

" All the animals we have been speaking of crawl along upon their stomachs, like the snail, and are therefore included in a class called *Gasteropods*, from two words meaning 'the belly' and 'a foot.'

" What a strange name!" said Henry. " I suppose it means that they have no other foot than their stomach. But that is the case with slugs as well as these creatures."

"And slugs," said his father, "also belong to this class, and are called 'shell-less gasteropods,' yet most of them have a small flat transparent oval shell, which can only be seen by cutting open the mantle, within which it is hidden."

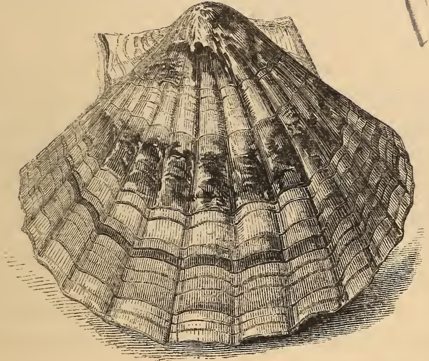
WENTLETRAP.

The children were very much surprised to hear that slugs had shells.

"I wish I could find a dead slug," said Henry, "that I might cut it open and see this little delicate shell. I would not be so cruel as to cut open a living one."

"I spoke to you first of the snail," said his father, "because you are so well acquainted with its appearance and habits; but I ought rather to have begun with another class of mollusks, which must be considered inferior to snails, because they have no distinct heads."

"They must be inferior, indeed," said Henry, "for snails have very curious heads, and beautiful black eyes, at the end of those long horns which they put out and draw in so cleverly."



THE GREAT SCALLOP.

"And yet," said his father, "in looking at the shell of a headless mollusk, we do not see any signs of inferiority, for it is often very handsome both in shape and markings. These headless animals live in what are called *bivalve* shells, that is, shells consisting of two plates fastened together by a hinge. That large shell in your drawer is one valve of the Great Scallop, and you may see the animal also in the markets, where it is often exposed for sale."

"I picked this up myself on the shore," said Henry, "and Mary found this smaller one, with pretty pink markings. What are the animals like that live in them?"

"If you looked into the shell of the living animal, you would see two pieces of thin transparent substance, joined together near the hinges. This is the mantle, and its edges are studded with glands and fringed with little fleshy filaments. Between the two leaves of the mantle are placed the lungs or gills, which are very beautiful in their structure, and are four in number. A simple opening between the inmost gills forms the mouth of the animal, and near the mantle is a small fleshy organ called the foot."

Henry looked at the scallop shell to see if there was any sign of the hinge his papa spoke of. He was told that the hinge is a mass of elastic fibres, very well seen in the oyster, which is one of these headless animals.

"I think the hinge must go very stiffly in oysters," said Mary, "for I have seen people working hard to get open the shell."

"It is not the hinge which keeps it shut," said her father, "but a very powerful muscle that passes from the middle of one shell to the middle of the opposite one. It is only by breaking the edges of the shell sufficiently to slip a knife between, and so to cut away this strong muscle, that the oyster can be opened at all."

"Do not pearls grow in oysters?" asked Robert.

"Not in the common sort, although they are lined throughout with a very beautiful substance commonly called *mother of pearl.* The real pearl-bearing animal is not a true oyster, but a species of mussel, yet it always goes by the name of the pearl-oyster."

"And what are pearls?" asked Mary. "Do they grow in the oyster-shell, or does the creature make them?"

"Pearls are produced when the mantle of the oyster is wounded or irritated. There are small boring worms which pierce the shell and penetrate to the body of the animal. The mantle then sends forth a quantity of pearly matter over the wounded spot, and this at last becomes a little knob or pearl. Or if a grain of sand or a small fragment of stone gets into the shell, the mantle is irritated, and completely coats it over with the same substance, making a valuable detached pearl."

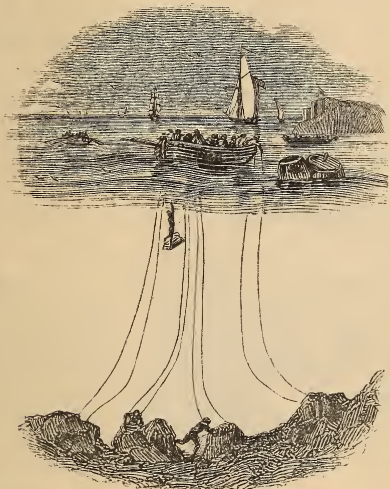
"Poor creature!" said Mary, "I am sorry it is in pain when it makes the pearls."

Henry said he had read about the pearl-fishery near the island of Ceylon, and how the fishers go out in boats, and men are let down by ropes to the banks where the oysters are clustered. "The divers gather the oysters as fast as they possibly can," said he, "for they lose their breath and cannot stay under water more than a minute."

"How do they let the people in the boat know when they want to come up?" asked Robert.

"They give a pull at the ropes," said his father, "and are immediately drawn up with the greatest speed possible. Other divers then go down while these rest. Henry should have said that there are two ropes for each man, one with a heavy stone tied to it to make the diver go down rapidly, the other without a stone, which he uses in coming up."

Henry took a common shell from his drawer



PEARL DIVERS.

and said, "This is what the fisherman called a mussel: is this any relation to the pearl-bearer?"

"It is," said his father; "and has also been found to produce seed-pearl, that is, pearls of very small size. The fresh-water mussel was noted in former years on this account, and some of the rivers of Britain have been the seat of a humble sort of pearl-fishery. The Esk, the Conway, and the Irt, were among the principal, and the rivers of Tyrone and Donegal, in Ireland, were also celebrated."

"I will search for pearls on the beach," said Robert, "for the rocks in some places are covered with small mussels."

"I fear your search will be in vain," said his father, "for even in spots that were once celebrated we only hear of about one mussel in a hundred producing a pearl, and that often a poor little discoloured thing that was of no value. Besides, the process of searching for pearls is not the most agreeable

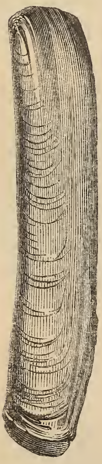
MUSSELS EMBEDDED IN ROCK.

in the world, if it must be done as it is in Ceylon, where the pearl animals are first left to putrify in the sun, and are then washed in sea-water in a trough, at the bottom of which the pearls are found. The odour from the decaying fish is said to be detestable. Instead of a fruitless search for pearls, examine the silky threads with which the mussel fastens itself to the rock, always below high-water mark. There is another animal called the Pinna, or wing-shell, which makes beautiful threads of the same kind, so long and fine that in Italy they have been woven into a sort of cloth. The Clamp is another which fastens itself to the rock in the same way; but being a very large animal, it makes a cable instead of thread. The Gigantic Clamp of the Indian Seas, is said to weigh three hundred pounds."

"What an enormous fellow!" said Henry. "It must be a good strong cable that holds him to the rock."

"It is so strong that it requires several strokes of an axe to cut through the tendons. The flesh of the animal is tough, but eatable, and is in such enormous quantity that one Clamp is declared to be a plentiful meal for a hundred and fifty men."

Henry found it difficult to believe this, and thought it might be that owing to the toughness of the flesh the men were soon satisfied. He next showed his papa a long narrow shell of his own finding, and asked its name.



RAZOR SHELL.

"That is the Razor Shell, and the animal that lived in it is very clever in burrowing in the sand, which it does by the organ called the foot—a much larger foot than that of the oyster. The cockle has a similar organ, and is also a burrowing animal. The work of the animals which bore in wood or stone is not so easily explained. The Ship-worm bores holes in the timber of ships, and in piles driven into the water, until they are completely destroyed.

"What does it do that for?" asked Mary.

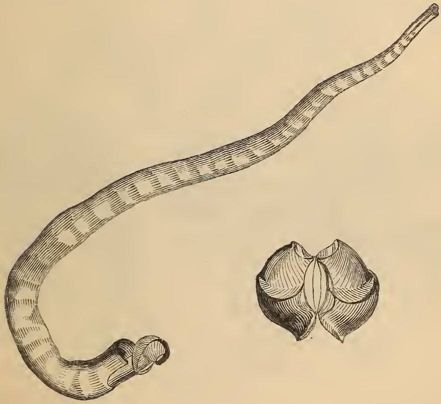
"For the protection of its naked body, the shell being very small. It also swallows some of the sawdust, but not for nutriment, as it appears to feed on substances contained in sea-water."

"What does it bore with?" said Henry.

"That is the mystery," replied his father.

"The shell is too small and thin to be used in filing away the wood, as some have supposed, and although there is a mouth, there is no distinct head or jaws to perform such a task."

"The piles lower down the beach," said Henry, "look very odd from being covered with broad-headed nails, so that you can hardly see the wood. The fishermen said it was to save them from the worm."



SHIP-WORM AND SHELL. (*Teredo.*)

"It is found to be the very best plan for preventing its attacks," said his father. "A coating of rust forms over the nails, and is as effectual as a copper sheathing."

In looking at the picture of the ship-worm, the children wondered at the very small size of the shell compared with the length of the animal. The mantle was in the form of a long tube.

"The stone-borer," said their father, "is another formidable little creature, since it can make our breakwaters and other marine works unsafe. Here is a picture of these animals living in the caves they have made in a piece of stone. You see that

STONE BORER. (*Pholas.*)

they have a much larger shell than the ship-worm, and can draw their bodies into it at pleasure. Fortunately neither of these animals can live in fresh water.—But it is time that we leave these headless animals and mount to a higher class. I must just tell you that there are also animals having leathery coverings,* instead of bivalve shells, which are sometimes included in this class. They unite in masses, and many of them, when floating in the seas of warmer latitudes, exhibit phosphorescent light and brilliant colours. There are likewise myriads of small animals in the ocean having fleshy wings near the head instead of shells. They have no feet, and as these wings are the only organs of motion, the creatures form a small class of themselves, named Pteropoda, from two words, meaning 'wing' and 'foot.' Hosts of these little creatures form the chief food of the whale in the Arctic Seas. There are likewise creatures which approach very near to crustaceous animals in some respects, while they resemble mollusks in others. Of such is the common barnacle, in which the parts of the shell are united in a tough leathery footstalk, which attaches the animal to floating timber," &c.

---

* Acephala tunicata.

CONVERSATION XVI.

MOLLUSKS—(CUTTLE-FISH, ETC.)

"These mollusks are very curious creatures," said Henry to his sister. "I begin to think they are as wonderful as any of the other animals papa has told us about, although they are not so pretty."

"But then they make pretty shells," said Mary, "and paint them too, and the waters throw them about on the beach, and we pick them up, and mamma arranges them, and papa tells us their history."

"And Mary forgets it as soon as it is told," said her brother, laughingly. "But come, let us run to meet papa, and hear what he has to tell us next." So saying he set off at full speed, having caught sight of his father on the beach, and Mary and Robert followed as quickly as they could.

"You ask me if I have any more mollusks to describe," said their papa, "and I answer Yes, several; and these not headless ones, like the oyster, nor slimy crawling ones, like the snail, but creatures with large heads and eyes, and with a sort of parrot-beak and eight or more fleshy arms, very long, and with a number of suckers on the under side, which cling with a fatal grasp to their prey."

"Have we ever seen any of these odd creatures?" asked Henry.

"I think not; but you have handled and admired the delicate white shell of one of them, called the Nautilus or Argonaut."

"Oh, yes; it was as thin as paper, so that I was quite afraid of breaking it; and yet you said the animal used it as a little boat and sailed about in it on smooth seas."

"The shell is much prettier than the creature that lives in it, as I am sure you will say when I show you a picture of the Paper Nautilus."*

"Oh, papa, what a strange creature!" cried Mary; "it seems to be all head and legs; and what a fierce-looking eye it has!"

"All the creatures of this class," said her father, "may well be described as nearly 'all head and legs,' for the legs come immediately from the head, and the animals have the odd name of *cephalopods*, from two words meaning 'head' and 'foot.' Some of them are much more fierce and formidable in appearance than the little nautilus, which is a general favourite, on account of the beauty of its shell, and the power it has of spreading out little silvery sails, tinged with purple and gold colour. These sails are only possessed by the full-grown animal, and consist of membranes spreading from the two fore-arms so as entirely to cover the shell, except when raised to catch the wind. When alarmed, the little boatman wraps the sails round its shell, and suddenly sinks beneath the waves. Like the other animals of this class, it can discharge an inky fluid which colours the water and favours its escape. These singular creatures may frequently be seen sailing about on the smooth waters of the Mediterranean."

---

* See page 199.

"I wish they would come and sail in our seas," said Robert; "it would be so amusing to see them turn the water black when they wanted to hide themselves."

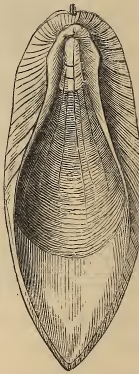
"You may perhaps see that, as I have done, in the case of the common cuttle-fish, whose ink is very abundant and intensely black. Many years ago I was in a small boat on the Solent (as that part of the sea is called between the Hampshire coast and the Isle of Wight), when one of the boatmen leaning overboard for an instant, brought up in his hand a creature from which was pouring a stream of inky fluid. The man dexterously slipped out from the body of this animal the plate, or internal shell, which gives support to it, and

CUTTLE-FISH AND EGGS. (*Sepia.*)

then threw back the remains into the sea. How he caught it I cannot tell you, for I was too much astonished at the sight of the ink to ask about anything else. This was one of my first excursions on the sea, and the catching of the cuttle-fish was an interesting event to me."

"There is some cuttle-fish bone in the study at home," said Henry. "Is that the plate you are speaking of, papa?"

"It is; and, as you well know, it is a very curious substance, and exceedingly brittle. In the body of the cuttle-fish it is enclosed in a case, and seems almost as if it did not belong to the animal. The cuttle has two long feet in addition to the eight arms, and is a voracious creature, preying on fish. The skin is purplish-white with red dots, and the eyes are very hard and pearly, and are in fact worn as necklaces in Southern Europe."



CUTTLE-FISH BONE AND CASE.

"I should not like to wear a necklace made of eyes," said Mary.

"In the same class with the cuttle-fish is a creature called the Calamary, or Pen-fish, because the plate which supports its body resembles a quill. Another kind of calamary called the Squid is remarkable for the quantity of ink it throws out when alarmed. There are also Hooked Squids, which, besides the suckers on their arms, are provided with sharp hooks, one in the centre of each sucker, which pierce the prey in holding it fast. In one of the Polynesian islands, Sir Joseph Banks found a creature of this kind six feet long, and it appears that the natives live in great dread of them."

"I do not wonder at that," said Henry. "For my part I should be very sorry to bathe in the seas where these creatures live."

"I have yet one more family of these Cephalopods to describe, and this consists of powerful creatures,* not requiring the aid of a shell either external or internal, but having in other respects the same general construction as the rest of the class. One of them, which inhabits our own shores, has a hundred and twenty pairs of suckers on each arm, making nearly two thousand in all. The animal is called the Poulpe, and is a great destroyer of fish and crustaceous animals. I have never heard of any person being injured by it in this country, but perhaps if it were ill-treated it might take its revenge as a foreign species once did on a gentleman named Beale, who was searching for shells on the Bonin islands."

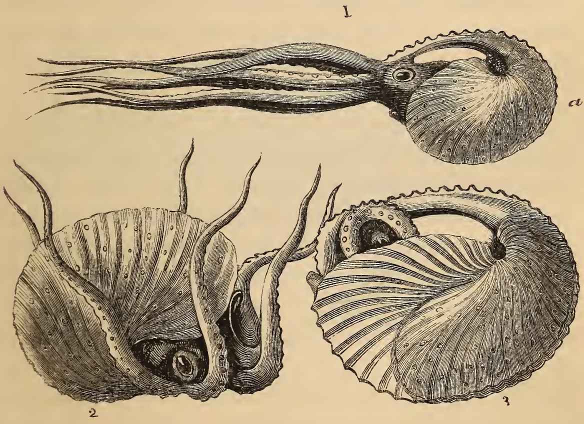
---

* Octopus.

"Will you tell us about it, papa?" said Robert.

"Mr. Beale had bared his arm to the shoulder that he might thrust it into holes in the rocks for shells, when he saw at his feet a strange-looking creature with long arms or legs, on which it was crawling towards the sea. He tried to stop it by treading on one of the legs, but the animal was too strong for him, and drew it away. He then caught hold of it with his hand and gave the animal a jerk to try and loose it from the rock, but he could not accomplish it. The moment after the enraged creature sprang suddenly on Mr. Beale's naked arm, clinging to it with great power, and bringing the beak forward in a position to bite. A sensation of horror ran through his whole frame, in finding himself attacked by this monstrous animal, whose cold, slimy grasp was extremely sickening. He called loudly for help, and a companion who was searching for shells at some distance ran to his aid, and took him down to the boat, Mr. Beale all the while working hard with his other hand in keeping off the beak of the creature from his arm. By means of the boat-knife the enemy was destroyed, but it had to be taken away from the arm piecemeal, for its hold was strong even in death. This animal measured four feet across its outstretched arms."

"It must have been a terrible creature," said Henry, "but I dare say it would not have done any harm if it had not been provoked."



THE PAPER NAUTILUS.

(1. *Swimming towards* a. 2. *Walking.* 3. *At rest.*)

CONVERSATION XVII.

VERTEBRATED ANIMALS—(FISHES.)

" How many divisions of the animal kingdom have we talked about since the day when you asked me to begin at the lowest step of the ladder and gradually mount to the top?"

Such was the question put to Henry by his father; and it was soon answered, for Henry was very fond of animals, and did not easily forget what he was told about them.

" We have gone over three great divisions," said he; " and this is how they follow each other: First, *radiate* animals, because their limbs spread out from the middle like rays from a star; next, *articulate* animals, which means jointed animals, because they are full of rings or joints; and next, *molluscous* animals, which means soft-bodied animals, because they are soft, slimy things, like the snail and the slug."

" Right," said his father: " there now remains one more great division to finish our subject."

"Only one!" cried the children, in great surprise.

"Do you mean, papa," said Henry, "that when you have told us about one more division you will have come to the end of this great animal kingdom, which you said would take such a long, long time to describe? There are birds, you know, papa, and fishes, and lions and tigers, and horses and oxen, and hundreds of creatures beside, that you have said nothing about yet."

"I know it all," said his father. "I see the vast host lying before me; but if I could get a skeleton of every living species, you would see in a moment that it is perfectly right to consider them as one division, and one only, for they are creatures that have one very striking feature common to them all."

"But how could you see the features if you only had the skeleton?" asked Mary.

"I do not mean a feature in the face, but a feature in the frame-work of their bodies. That feature was very plainly seen in the poor starved cat Robert was feeding this morning."

"I do not understand you, papa," said Robert. "The cat came mewing at the window while

I was at breakfast, and I asked mamma to let me give her some of my bread and milk. The poor thing was so thin that, when I stroked her, I could feel every bone in her back."

"Exactly. The back-bone, or spine, is the feature I allude to. All the creatures of this fourth division have a back-bone, which, you remember, none of the other divisions had. You felt plainly enough that the back-bone of the cat was full of joints. It is made up of a number of distinct pieces of bone, which are all locked together, and firmly braced, with cartilage, or gristle, which allows of the bending and twisting of the body in any direction."

"If the bone was all in one," said Henry, "I suppose the backs of animals would be very stiff. Puss would not have been able to jump up on the wall so easily if it had not been for the joints in her back."

"Nor could she have moved her tail about as she did, for that is a continuation of the back-bone, and the joints are close and numerous. A very beautiful arrangement it is, that between every joint there is a little pad, as it were, or ring of gristle, so that the bones do not grate against each other in all these bendings and turnings. Another grand advantage of this pad is, that it prevents any gap, or space, between the bones when the back is bent."

"Why is that such an advantage?" said Henry.

"Because the back-bone forms a hollow tube within, reaching along its whole length, and passing through every joint: and in this tube is a very precious substance, called the spinal marrow, the value of which to the body I cannot explain to you; but it is sufficient to say that it is connected with the brain, and that injuries done to it are fatal. All this apparatus of bones and ligaments along the back forms a safe place for this precious substance, where it is not likely to meet with harm. Each division of the spine, from one joint to another, is called a *vertebra;* and this word has given a name to the whole assemblage of beings we are now considering, and which are called *vertebrated* animals."

"Please, papa, to tell us about some of them," said Robert.

"To begin with the lowest, I must take fishes: but I can only give you a very rapid and general view of them. In some of the simplest of these animals the spine is nothing more than a soft, gristly tube, without ribs, and the body of the animal is long and worm-like, as in the lamprey. The division to which this animal belongs is that of the cartilaginous fishes, so called because their skeletons are not formed of bone, but of cartilage, or gristle."

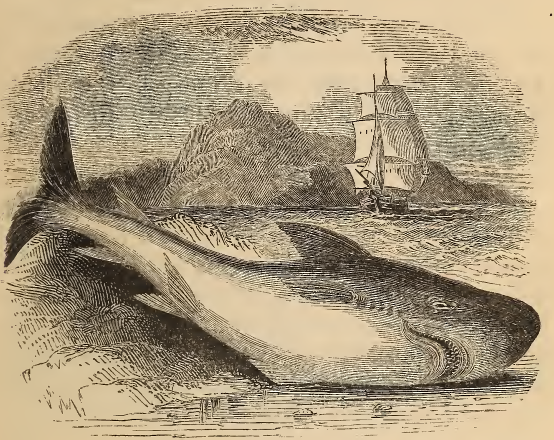
"They must be poor weak fishes with such soft skeletons."

"You would naturally think so; but you will be surprised to learn that the strong and voracious shark belongs to this division."

"Oh, the terrible creature!" cried Henry. "I have heard that it has six rows of teeth, and that it can cut a man in two at one bite. It has plenty of bones in its mouth, if it has not any in its back."

"That is true; and it makes most dreadful use of them, as you well know from the many stories you have read of this fish. The mouth, as you see in this picture, is situated very far back, on the under part of the fish; and this is the reason why the shark always turns over on its back when it is about to seize its prey."

"If there are any sharks in the sea round Ceylon," said Henry, "the pearl-fishers must stand a very poor chance with them."



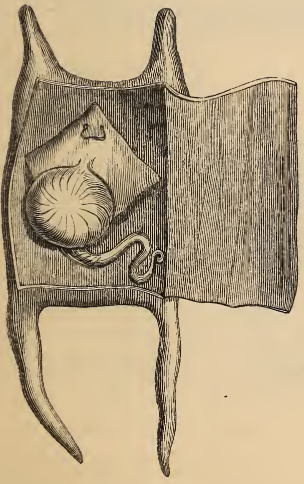
THE SHARK. (*Carcharias.*)

"I have read," said his father, "that these men have the courage to await the approach of a shark, and, just as he opens his enormous mouth, they thrust in a strong piece of wood, sharpened at both ends, and held in an upright position. This prevents the jaws from closing again, and, in consequence, the fish is drowned."

"How can a fish be drowned?" asked Mary; "I thought it breathed water instead of air."

"So it does; but water contains a great deal of air; and fishes depend on it for life, as we do. If a pond is frozen over, the fish in it die for want of air. Although fishes appear to be constantly swallowing water, yet they only take it into the mouth and pour it out again through those openings on each side of the head called gills, which act the part of lungs. Of course, if the mouth be forcibly kept open, the water is swallowed, and the fish suffocated. But this experiment with the shark is a fearful one, for failure must be certain death. The family of sharks contains a strange, wide-headed kind, called the Hammer-headed Shark: it also includes the Blunt-headed Dog-fish, which you often hear the fishermen complain of as doing so much mischief in the seas. The Saw-fish is also nearly allied to, although it is the enemy of the shark, and has been seen to wound him severely with its projecting snout, which is shaped like a sword, and armed with very sharp spines."

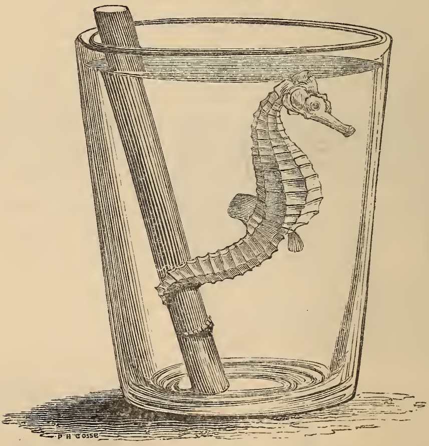
"How odd that all these strong creatures should have soft skeletons!" said Henry.



POUCH AND EGG OF THE SKATE.

"Though their skeletons are not bony, yet in these higher races they are much firmer than in the lamprey and its relations. In the dog-fishes, for instance, the spine is completely divided into vertebræ, instead of being a mere tube. Rays and Skates are also cartilaginous. The Torpedo, or electric ray, has the power of giving a slight electric shock. The egg of the skate is contained in a curious pouch, or purse, which protects it until the fish is perfected and makes its escape. The empty pouch is then frequently washed ashore; and I doubt not you may find some by searching on the beach. I have one more fish of this division to name, and that is the Sturgeon. This fish has no teeth, but is well armed with bony plates and spines, in rows outside its body.

So much for the cartilaginous fishes. Let us now proceed to the bony fishes, noticing, first, those that have soft fins. The lowest of these are curious fishes, whose bodies are covered with



SEA-HORSE, OR HORSE-WORM. (*Hippocampus.*)

hard plates, arranged in regular lines, and whose jaws are united together so as to form a tube."

"Then how can they eat?" asked Robert.

"They suck up their food through the tube. A singular little creature of this kind is called the Sea-horse, because the head is shaped much like that of a horse. It grasps objects with its tail, and thus waits for its prey. The skin of this fish, about the head, shows bright and changing hues. A little higher than these in the scale are eels, of which we have three fresh-water species besides the large marine species, called the Conger. Fresh-water eels, however, go to the sea in winter, and remain there until warmer weather tempts them into the streams again. But I must now say a few words about another soft-finned family, that of the flat fishes, containing the plaice, hallibut, turbot, and sole."

"I saw the soles brought in from the fish-monger's one day," said Henry, "and before cook took their skins off, one side was brown and the other white. It must look very odd in the water to see these fishes swimming about, some seeming to be brown fish, and some white, according to which side they turn towards you."

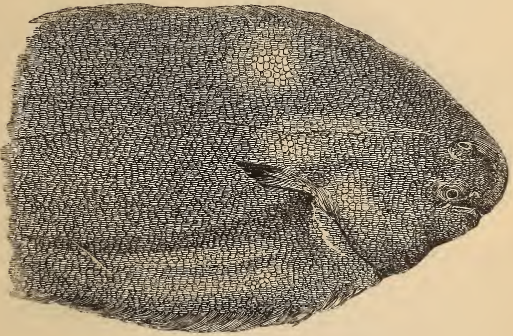
"That is very seldom the case," said his father. "These flat fishes are different from all the rest of the vertebrated animals. In all the others, one side of the body exactly corresponds with the other side; but in these the sides are different, and the fish, instead of keeping in an upright position, swims slowly on its side, lying in the water just as you see it on the fishmonger's tray."

"Then the brown side is always uppermost," said Henry.

"Not *always*, for when alarmed these fishes dart along in the usual position of fishes; but they soon return to their favourite posture, lying on the side, with the brown side upwards, which being very much of the same colour as the mud among which the fishes live, serves to hide them in some degree from their enemies."

"Do they stay at the bottom of the water, then?" said Robert.

"Yes; they are what are called ground-fishes, and find their subsistence there. Now, if they were formed like other fishes, and had an eye on each side of the head, one eye would be nearly always buried in mud, and would be of no use to the animal; therefore, they have both the eyes on one side, and are constantly looking upwards."



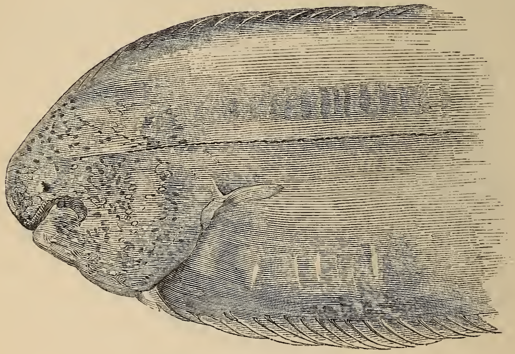
UPPER SIDE OF THE SOLE. (*Solea.*)

"How very odd!" said Mary: "and what a strange thing it is that I never saw this in the soles we so often have for dinner!"

"You would not notice it in fish that have been made ready for cooking; but if you look at them before they have been skinned and prepared, it will be plain enough."

"I thought the brown side was the back of the fish, and the white side was the belly," said Robert.

"It was very natural you should think so, but



UNDER SIDE OF THE SOLE.

if you look at the mouth, you will see directly that it cannot be so."

"I have seen pictures of turbot and flounders," said Henry, "in your large book at home, and they are all drawn with two eyes near together on one side, which makes them look very odd; but I thought they had two more eyes on the other side to match these; and I told Robert they were curious fishes with four eyes."

"I am not surprised at the mistake," said his father; "and I am sure many must fall into it, unless drawings are made of both sides of the animal. The turbot is the most highly prized of the flat fishes, as an article of food. The next family of soft-finned fishes is that which contains the well-known ling, whiting, and cod. You must ask me on some other occasion to read you an account of the cod-fisheries at Newfoundland, as well as the turbot-fishery off the Dutch coast."

"Why do you call all these creatures soft-finned?" asked Henry.

"Because the fins are supported by soft, flexible rays, which circumstance gives the name to a whole section of fishes, containing many orders. The last of these orders we have to notice, and the highest in importance, is that which contains the carp, pike, salmon, trout, herring, pilchard, sprat, whitebait, shad, and anchovy families, besides many foreign fishes. Some of these, as you know, live in fresh water, and some inhabit the sea."

"Trout are very pretty creatures," said Mary: "I have seen them just after they are caught, and they have beautiful red spots on their sides, besides golden and silvery tints."

"And I have seen plenty of roach, and dace, and minnows," said Robert.

"These, also," replied his father, "are included in the order we are now speaking of, which indeed contains nearly all our fresh-water fish. The king of our river fish is the Salmon, which winters in the sea, and comes up our streams early in the year. In this order, also, is an extraordinary marine fish, which, by means of its large fins, can take a long leap out of the water, so that it appears to be flying. They take these leaps to avoid their enemies, the larger fishes, but by doing so they sometimes become the prey of rapacious birds. They are small, shining fishes, and inhabit, in shoals, the warm seas of tropical climates."

"Are there many other fishes besides these?" said Robert.

"Yes, there is a large order of bony fishes, whose fins are strong and spiny, and which are therefore named thorny-finned fishes. To these belong the families of perch, gurnard, bream, mackerel, mullet, blenny, and several others."

"I have never heard of the Gurnard," said Henry.

"Perhaps not; but you know the little Stickleback, which is common in our rivers and brooks, and that belongs to the gurnard family."

"Is not the Mackerel that pretty mottled fish we see in the shops, with dark and light patches at regular distances all along the back?" inquired Henry.

"It is; and to the same family belong the Tunny and the Sword-fish. In the latter, the upper jaw is prolonged into a bony spear or sword, which is a formidable weapon, and has even been known to pierce the copper, planks, and timbers of a ship."

"Which do you think is the handsomest of fishes?" asked Mary.

"If you mean of our common river fish, and if we leave out of the question the salmon (which is only an occasional visitor), I should say that the Perch deserves to be considered the most beautiful, though not the largest, of our fishes. The colours of the living fish are extremely handsome, the back being of a fine green, clouded with brown, the under parts pearly white, and the fins pale red. The shape also is fine, as you may see by a drawing of this fish, which I have to show you."

THE PERCH. (*Perca.*)

"What large, staring eyes fishes have!" said Mary, when she had looked at the picture.

"Those large eyes are no doubt given them to supply the deficiency of light in their deep abodes. Yet their eyes are very inferior to those of higher animals. Cuvier, the great naturalist, tells us that the eye in fishes 'scarcely changes its direction, still less can it change its dimensions and accommodate itself to the distance of objects; its *iris* neither dilates nor contracts, and its *pupil* remains the same in every degree of light. No tear bathes this eye, no eyelid soothes or protects it: and in fishes it must be regarded as only a feeble representation of that brilliant, beautiful, and animated organ of the higher classes of animals.'"

"Fishes cannot weep, then," said Henry, "whatever their troubles may be! But, papa," he continued, "I want you to tell me about the fins in fishes. Are those fan-looking things which stand up on the back of the perch called fins, as well as those at the sides?"

"Yes, those two on the back are called *dorsal* fins; those on the belly, *ventral* fins; and those at the side, *pectoral* fins. They all assist in balancing the fish, or in giving motion to the body; but the tail is the great organ of motion in fishes. There is also a wonderful and beautiful provision to enable fishes to rise and descend in water as they please. This is a long air-bladder within their bodies, which, on being simply pressed or relaxed, causes them to become heavier or lighter than the surrounding fluid. The flat fish have no swimming bladder, because they live at the bottom; and in other fishes this remarkable organ is larger or smaller, according to the need of the animal."

The children were here dismissed, to make preparations for their journey home, which was to take place the following day; but Henry could not help running back to the parlour, and saying, "Oh, papa! you have forgotten the largest of all the fishes: you did not tell us anything about whales."

"You shall hear of them another day," said his father, "but not among the fishes, to which class they do not properly belong."

CONVERSATION XVIII.

REPTILES.

The children were delighted to return to their own dear home after six weeks' absence. All their old pleasures were entered into with eagerness, and all their old walks seemed doubly beautiful, after being accustomed to the treeless and barren sea-shore. The garden indeed had lost most of its honours, and began to look damp and desolate. One day, when Mary was exploring its nooks and corners, she found beneath a stone a large toad, whereupon she immediately set up a loud scream, which brought a reproof from her father.

"Never again let me find you," he said, "imitating the example of those silly or affected persons who scream at the sight of a frog, and fall into hysterics at the appearance of a mouse, or some other equally harmless creature. This toad is certainly not a pleasing object, but it is a most inoffensive creature, and will serve as an example of those reptiles which live in the condition of fishes during part of their lives, and afterwards become land animals."

"Oh, yes," said Henry, "toads and frogs are tadpoles at first, and look just like curious little fishes, swimming about very rapidly in the water."

"After living thus for some weeks," said his father, "their gills are gradually exchanged for lungs, the legs begin to appear, and the fish becomes a reptile or creeping animal, sometimes sluggish in its movements, as in the toad, sometimes with considerable activity, as in the lively and graceful frog."

Even Mary admitted that young frogs were pretty creatures, and Henry said he had often taken them up in his hands for the pleasure of seeing them leap to a distance. They were all surprised, however, when their father told them the story of a tame frog that inhabited a kitchen on the banks of the Thames for four years, coming out of his hole at meal times, and feeding on what the servants gave him. A curious part of this animal's history, in which he seemed to differ from his race, was his love of warmth, which he indulged by nestling beneath the fur of a cat, who was on very friendly terms with him.* They were also much amused to hear, that on the Continent there are tree-frogs, which live among the leaves, pursuing insects, but which lay their eggs in water.

"How do they get up in the trees?" asked Robert; "do they make a great leap from the ground?"

"No; they climb by means of a peculiar form of their toes, which spread out into little discs or suckers, enabling them even to crawl up the glass of a window. In the same order with frogs and toads are small animals called water-newts and salamanders, the latter being erroneously supposed to be able to pass through fire without being hurt."

"I think frogs and toads must be distant relations of fishes," said Mary.

"There is a certain relationship," said her father, "throughout the whole animal kingdom, and it is very interesting to see how one group gradually approaches another as we ascend the ladder of life. A step higher in the reptile race we find serpents, then lizards, some of which have wing-like appendages, which remind us that we are approaching the birds."

---

* Bell's British Reptiles.

"We have no serpents in England, have we, papa?" said Robert.

"Our snake and viper belong to the serpent race," replied his father; "but we have none of those large creatures which are especially meant when we speak of 'serpents.' The common snake, as you know, is quite harmless, but the viper has poison-fangs in its upper jaw, which make its bite dangerous."

"How might we know a viper from a snake?" asked Henry.

"The snake has four rows of roundish black spots running lengthwise at some distance from each other on its light grey skin; the viper has a series of diamond-shaped black spots, collected into a broad band running down the back, with a row of smaller spots on each side of it. The viper is our only venomous reptile; and it is related to the formidable rattle-snakes of America."

"I wish the viper had a rattle too," said Mary; "we should then always know it from the common snake."

"The rattle is at the end of the tail, and consists of a number of bony cups, fitting loosely into each other, and making a rattling sound when the snake is agitated, or about to make a spring. Squirrels, birds, and other small animals are the chief prey of the Rattle-snake, and it seldom attacks man unless provoked. Among the true serpents are the gigantic Boa, and other creatures of great size, which, though not venomous, are alarming from their size and voracity. I will show you a picture of the Boa-constrictor."

"That is the creature," said Henry, "that can crush the bones of a wolf or a deer, and then swallow it whole."

"How can it do so with that small neck?" said Mary. "There does not seem to be room to swallow even a haunch of venison, much less a whole deer."

"The jaws of these creatures," said her father, "are so loosely jointed, and the skin is so wonderfully elastic, that substances can be swallowed which are much bigger than the natural size of the serpent's own body."

"I suppose they get rid of the horns before they swallow a deer?" said Henry.

"Strange to say, they swallow horns and all," replied his father, "and for days afterwards the shape of the horns may be seen through the skin of the serpent, as if ready to burst through."

THE BOA-CONSTRICTOR.

"That is the time to kill them," said Mary, "for they are sleepy and helpless after a great meal."

"Leaving serpents," said her father, "we come to the lizard race, and to the tortoises. These latter differ from other vertebrated animals by having the trunk of the body enclosed in a bony case, and the vertebræ united in one unbending

THE COMMON LIZARD.

column, except at the head and tail, where motion is wanted. The strong castle of the tortoise is in some species, as you know, beautifully marked, but it is a bony substance after all, and not true shell. In the sea-tortoise or turtle, the bony case is smaller, but the flesh is much prized for its wholesome and delicate flavour. As for lizards, I think you have seen the active little lizard of our sunny banks. Some of the foreign species are beautiful and curious animals, and one has membranous wings which assist its leaps. It is a harmless little creature, called the Green Dragon; but it is a very different being from that which old fables represent under that name. The terrible dragon of romance is not to be found in nature. There are, indeed, very formidable creatures in the same order with lizards; but these are the well-known alligators and crocodiles."

"Is there any difference between alligators and crocodiles?" asked Henry.

"Very little, and that only in the teeth; but alligators are confined to America, while crocodiles abound in Africa. The degrading idolatry of the ancient Egyptians led them to worship the crocodile of the Nile, and some parents were even so deluded as to rejoice when the crocodile devoured their children."

"Unkind, unnatural people!" cried Mary, "how could they be so cruel!"

"Their religion, my child, was a cruel one, and full of fear; nor need we wonder that in the depth of their ignorance they sought to appease the anger of their gods and to calm their own consciences by the sacrifice of that which was most dear to them. Pity them, and thank God every day with your heart, as well as your lips, when you repeat the hymn you are so fond of, beginning,

> "'I thank the goodness and the grace
> Which on my birth have smiled,
> And made me, in these Christian days,
> A happy English child.'"

CONVERSATION XIX.

BIRDS.

(*Web-footed—Waders—Common fowls—Climbing-birds—Perchers, &c.*)

One frosty morning the children found a dead goldfinch in the garden, and while they admired its plumage, and wondered how it came by its end, Mary said, "I suppose it must have been starved to death, for it is very thin, and almost as light as a feather."

"Birds are wonderfully formed for lightness," said her father: "their bones are hollow, and filled with air instead of marrow. Air-cells are also placed in various parts of their bodies, and these communicate with the lungs, so that they can be emptied or filled as occasion requires. Look at the bill of this goldfinch, how delicate it is, and how different from the mouth of quadrupeds! Here are no heavy teeth and jaws, because birds do not chew their food, but swallow it whole; this light horny beak, drawn out to a point, cuts the air, and helps the flight of the animal. How strong and yet light are these quill feathers, which form the wings, and what an admirable rudder is this shapely tail! Birds are the most perfectly formed of all beings for rapid and extensive motion, and are among the most beautiful creatures with which God has adorned the earth."

"How is it," said Robert, "that our canary, after washing in its bath, looks such a poor drenched bird, and yet the ducks in the pond never seem to wet their feathers. I have seen the drops of water roll off their wings like beads."

"Web-footed birds, such as ducks, geese, swans, and other water-fowl, are provided with glands, containing an oily substance, with which they anoint their feathers. Their flesh also produces oily fat, and their plumage is very thick, especially on the breast, where they meet the waves. Thus they are much better provided against wet than other birds. Their webbed feet serve them as oars, and also enable them to dive beneath the water."

"Those curious pelicans in the Zoological Gardens are web-footed," said Henry, "and so I dare say are the gulls we saw last week."

"Yes," said Mary, "and the stormy petrel that sailors dislike, and those odd-looking penguins that sit upright. They must all want oars when they are in the water."

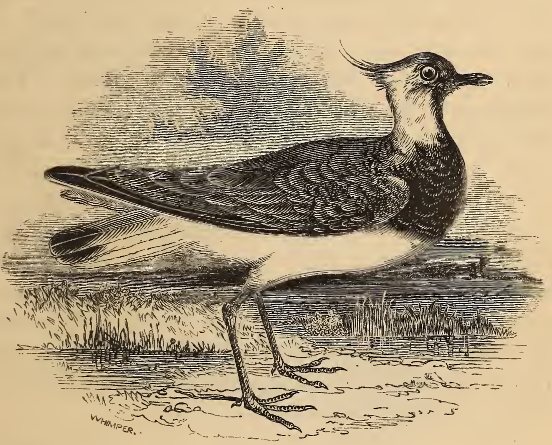
"The stormy petrel," said her father, "rather skims the waves than swims. During a gale at sea, this bird is all animation.

> "'Amidst the flashing and feathery foam
> The Stormy Petrel finds a home;
> A home, if such a place can be,
> For her who lives on the wide wide sea,
> On the craggy ice, in the frozen air;
> And only seeketh her rocky lair
> To warm her young, and teach them to spring,
> At once o'er the waves on their stormy wing.'"

"She must have plenty of oil in her feathers, not to get drenched in the spray," said Henry.

"These birds have so large a supply of oil in their bodies," replied his father, "that the inhabitants of the Ferroe and other islands sometimes use them as candles, drawing a wick through the dead body of the bird, and setting light to that end of it which proceeds from the mouth, and which will continue to burn till the oil is exhausted.

"Next to the web-footed or swimming-birds," he continued, "comes an extensive order of waders, or birds that feed in shallow water. These have long legs, so that they can procure their food without wetting their bodies. Of this kind are our pretty little lapwings, as well as our woodcocks and snipes, sand-pipers and rails. One of the rails produces a note you are well acquainted with in early spring. It is the Corn-crake of our meadows and fields, whose cry of *crake-crake* is so puzzling, and so often makes us stop in our walks."



THE LAPWING.

"One minute it seems close to us," said Robert, "the next we hear it at the other end of the field, and yet we cannot see the bird fly away."

"It is almost impossible to make it take wing, but it runs with great fleetness, and is so much of the colour of the ground that, be the corn ever so thin, we rarely catch sight of the bird. The female makes a nest of dried grass on the ground, and lays from eight to twelve yellowish-white eggs, spotted with brown. This bird prefers moist places, and the neighbourhood of streams. But the more remarkable birds of this order are the herons, storks, and cranes. Here is a picture of the Crowned Crane, and Henry will immediately recognise it as the bird he admired so much at the Zoological Gardens, and whose naked red and white cheek and bright round eye he compared to those of Mary's large doll."

"That is exactly like the bird," said Henry, looking at the picture, "and it is holding up one leg just as it did the whole time I was looking at it. That crest, Mary," he continued, "is a beautiful pale yellow one with little black dots: it is made up of thousands of delicate bristles all standing up on the head. I wish you could see it.

And then the front of the head is like black velvet, and the feathers of the body must have been very handsome once, all blue and black and brown, with a few white feathers in the wings.

THE CROWNED CRANE.

But the poor bird looked shabby, and did not seem to take much care of its dress. I am sure it did not like being shut up in that cage, although it was not like our cages, but a small piece of ground wired in. In the next cage, or one that was very near, we saw a young ostrich, which also had very long legs."

"Nevertheless, it does not belong to the waders," said his father, "but is nearly related to the common fowls, where the power of flight is very small. The wings of the ostrich are, as you know, too small to be of service in flying, and the bird does not need such help, being endowed with such swiftness of foot as to run more rapidly than a race-horse. It feeds on seeds and the tops of shrubs, but has an odd taste for swallowing hard substances, such as bits of stone, metal, or leather. I have heard that a fine ostrich in the Zoological Gardens died in consequence of swallowing part of a lady's parasol. You are pretty well acquainted with poultry of all sorts, therefore I merely mention that we have now arrived at fowls, turkeys, pigeons and peacocks, as well as grouse, partridges, pheasants, &c. Many of these birds are very beautiful, but from the habit of seeing them often we forget to notice their handsome colours and fine markings. They are all heavy of flight, and the pheasant, as you have often noticed, rises with great effort, and with a loud whirring noise of the wings."

"Nothing amused me more at the Gardens," said Henry, "than those impudent screaming parrots and cockatoos; there were such numbers of them together that I could scarcely hear my own voice for their noise. What tribe do they belong to?"

THE GREY PARROT.

"They belong to the climbing birds, all of which have a particular form of foot enabling them to mount trees. Two of the toes point forwards, and two backwards, so that the bird takes a strong hold. Toucans, cuckoos, and woodpeckers, belong to this order. You have heard the tapping and boring of the woodpecker in search of grubs in the trunks of trees; but this is a very feeble sound compared with that which resounds through the American forests when the Great Ivory-billed Woodpecker is at work. The loud strokes of his bill and the trumpet note which he utters make him seem like the king of those wild forests, and around the roots of the trees which he frequents whole cart-loads of bark and chips show what a powerful and industrious workman he is."

"His bill must be very sharp and strong," said Henry. "How much I should like to see him at work!"

"Attempts have been made to tame this fine bird, but I do not find that any have been successful. A naturalist* who took one and shut it into a room, found that in less than an hour the bird had torn away a large quantity of lath and plaster near the ceiling, scattering the fragments in all directions. It was then fastened by a string round the leg to a heavy table, but the solid mahogany could not resist its powerful bill, and while the owner was gone to search for proper food for the bird, the table was almost entirely ruined."

---

* Wilson.

"Why did he not get a strong and large cage, such as parrots are kept in?" said Henry.

"The poor bird did not live to require a cage. Refusing all food, it died at the end of three days. Not far from the woodpeckers are hornbills, kingfishers, and bee-eaters. These are united with a vast assemblage of other birds, many of which are very well known to you, and it is rather difficult to describe them by any peculiar marks, because they differ so much from each other. I shall, however, take advantage of a name given to them by recent naturalists, and call them "perching birds," most of them being small insect-eating and seed-eating birds, whose feet are admirably formed for perching on horizontal branches and twigs of trees. Some of them indeed may be said to make the air their home, for they are almost constantly on the wing. Such are swallows, whose low rapid flight in search of insects you have often noticed, and whose habit inclines them to rest under the eaves of houses, and to build in similar situations. Night-jars, which resemble swallows in their hooked beaks, perch on trees, and issue forth at close of day to seek the numerous moths that come out in the twilight. The Night-hawk and Whip-poor-will of America are of this family. The hooked beak and wide gape distinguish all these birds, as a long and slender beak marks the next family of perchers, which contains the beautiful humming-birds and sun-birds."

"Dear little creatures!" said Mary. "If I could only see them darting through the air and quivering their golden wings over their favourite flowers, how happy I should be!"

"Perhaps you would be less happy than you imagine," said her father, "for the land of the humming-bird is also the land of snakes and serpents, whose continued hissing is not very agreeable to the ear."

"What a pity!" said the little girl. "But I would keep within my own garden among the birds and flowers. The lady who sent us that beautiful humming-bird from St. Vincent caught it in her own garden with a butterfly-net, and it was not much larger than a butterfly."

"And what a pretty little nest it had, with two eggs in it!" said Robert. "The nest was lined with the down of the cotton plant."

"The plumage of your little bird is very rich," said his father, "but it is not to be compared with the brightness of living specimens. These abound in the West India Islands and on the continent of South America, and sparkle like gems in those sunny lands. They feed on very small insects, as well as on the juices of flowers. The smallest of all the humming birds is no bigger than a bee."

"What are the sun-birds, papa?"

"They nearly resemble the humming-birds, but are not quite so brilliant. They are natives of India and Africa. In the same family with all these brilliant birds are our humble Nut-hatch and Creeper, but it is doubtful whether they ought not to be placed with the climbing birds, whose habits they follow, although the structure of the foot is not the same. The next family of perching birds is distinguished by a short, strong, cone-shaped bill. This contains the most gorgeous of all birds, long the subjects of fable and romance."

"I think you mean the Birds of Paradise," said Henry; "for I remember reading that when first they were sent to Europe, the persons who stuffed them had cut off their feet, and so there came to be a story that these birds never had any, but floated about in the air like mists."

"It was said too," added his father, "that they lived on the morning dew, and were altogether creatures of the air, and not of our earth, which they never touched. All this fable has been done away, and birds of paradise are now merely wonderful for the magnificence and profusion of their gauze-like plumage, which astonishes the eye of an inexperienced person, like the passing of a brilliant meteor. They are natives of New Guinea and the neighbouring islands."

Robert asked where New Guinea was, and his father showed him on the map a large island to the north of Australia, marked "Papua, or New Guinea."

The children were surprised to hear that our crows, magpies, jays, and rollers, are nearly related to birds of paradise in their structure and in the tendency to metallic tints in their plumage, although they cannot boast such long sweeping feathers. “ The short conical bill,” he said, “ is possessed not only by these, but by the numerous and well-known buntings and finches, including among the former the common bunting, the yellowhammer, the reed-bunting, and the ortolan (which in the south of Europe is fattened as a delicacy); and among the latter the goldfinch, canary, house-sparrow, linnet, &c.”

“ Our bullfinch has a very short strong bill,” said Mary.

“ And those merry little birds, the titmice,” said Henry, “ have still shorter bills. I suppose they all belong to these perchers?”

“ All; and many more besides, such as the larks, which have in truth no right to be called perchers, having the foot formed for standing on the ground; and, again, those singular birds the crossbills, which are so clever in wrenching open fir cones, and extracting the seeds.—I have thus slightly noticed three divisions of the perching birds; namely, those with hooked beaks, as the swallows; those with slender beaks, as the humming birds; and those with short strong beaks, as the bullfinch. There is yet one more division in this large assemblage, known by having

LONG-TAILED TIT (*Parus caudatus.*)

the upper part of the beak slightly notched or toothed. This is most plainly seen in the shrikes or butcher-birds, and is scarcely perceptible in some other families of this division, which contains the thrushes, fly-catchers, and warblers. Among the fly-catchers is the singular lyre-bird with tail feathers curved into the shape of a lyre; and among the warblers are the nightingale, black-cap, white-throat, red-breast, wood-wren, and other sweet singers. I am sorry to take leave of this

THE RED-BREAST. (*Sylvia rubicula.*)

attractive family, but I have a few words to say to you concerning birds of prey."

"I know you will reckon the owl among them," said Henry, "for it was only this last harvest that we saw one catching mice in a wheat-field. Do you remember, papa, how it came out at sunset, and floated along over the corn without making the least noise, and dipped down now and then to catch its prey?"

"I remember it," said his father, "and also the fate of your pet owl, which you were to feed with mice of your own catching."

Henry looked as if the pet owl was not a pleasant subject; for in fact he had given his father some trouble to procure one for him, and had then been so careless as to leave the bird loose in a room where a deep pan of water was standing, into which by some accident the poor creature slipped and was drowned.

"Some people are afraid of owls," said Mary, "but Henry's was really a very handsome bird, and I did not once hear it make the screeching noise which owls make in general."

"That noise, no doubt, together with the nocturnal habit of the owl, has made it an object of superstition, but it is in reality the farmer's friend, by destroying the vermin that infest his fields and barns. Some of the foreign species are powerful birds, carrying off hares, rabbits, &c. But the more formidable birds of prey are the eagles, falcons, and vultures, which seek their prey in the daytime. Eagles, being the largest and most courageous, carry off animals of considerable size, such as lambs, calves, and even foxes and dogs. Vultures prefer dead or dying creatures, and are of great use in hot climates by clearing the ground of decaying substances. Falcons are remarkable for the sharpness of their beaks. They not only pick their game of feathers before eating it, but they cut it up in an expert manner. The true falcons were formerly much used by our ancestors in the sport called hawking. Kites and buzzards are also among birds of prey. The highest station among birds has been given to these rapacious tribes, on account of their great strength, their keen senses, and their formidable character; and no doubt in their natural haunts they possess a kind of savage beauty much in harmony with the rock or the wilderness they may inhabit. But in confinement they are far from pleasing objects. Their dingy plumage, their harsh screaming voices, their fierce quarrels over their food, and the voracious manner

THE KITE. (*Milvus ictinus.*)

in which they tear and devour the carrion offered to them, are likely to excite disgust rather than the thankfulness we ought to feel that God has provided so many scavenger birds for the purification of the earth. In fact we cannot fully judge of animals from the specimens we see in confinement, and it is frequently a great disappointment to find, instead of the powerful and energetic creatures we had pictured to ourselves, a group of drooping and spiritless beings, only to be roused by the daily meal.

CONVERSATION XX.

WHALES.

"I THINK papa will tell us about quadrupeds next," said Mary, "now we have finished reptiles and birds."

"Do you know what 'quadruped' means?" asked Henry.

"Yes; it means 'four-footed'" replied his sister, and 'biped' means 'two-footed;' Rover is a quadruped, and my canary is a biped."

"Can you tell what a whale is?" inquired her brother.

"A whale," said Mary, "has no feet at all, so it cannot be a quadruped or a biped, and yet papa says it is not a fish. I do not know what it is."

Papa was appealed to for a reason why a whale, which has fins, and swims about in the sea, should not be called a fish.

He mentioned several circumstances which point out the whales as belonging to a higher order of animals, especially these three; namely, that it breathes the air, that it suckles its young, and that it has hot blood, whereas the blood of fishes and reptiles is nearly cold.

"To breathe the air, it must always keep its mouth out of water," said Henry.

"Not so; the nostrils of the whale are situated on the crown of the head, so that the creature can breathe while feeding on the small animals with which the water swarms. It also sends out the water through these openings, which are called blow-holes. There is a beautiful arrangement of valves by which these nostrils are closed while the whale dives."

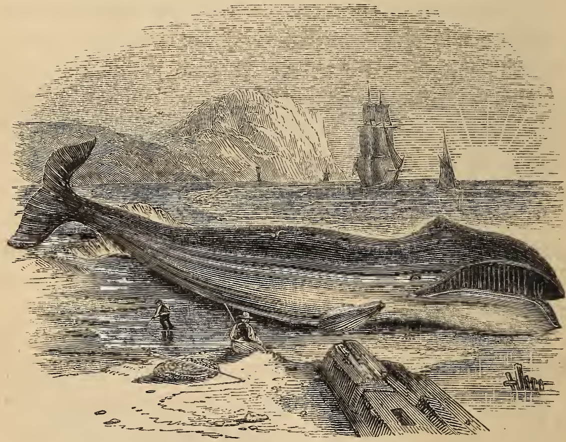
"Whale-fishers throw a spear with a long line fastened to it into the body of the whale," said Henry, "and the poor thing dives and swims away to try to get rid of it."

"Yes, and sometimes lashes the water terribly with its enormous tail, and upsets boats," said Mary.

"The whale's tail does not move from side to side, as in the fishes," said her father, "but upwards and downwards; this favours the diving of the animal, and also makes the tail a formidable weapon. The skin of the whale is full of soft oily fat called blubber, and forms a covering sometimes a foot thick, which protects its owner from the intense cold of the arctic seas."

"Where does the whalebone come from?" asked Robert.

"From the mouth of the true whales, which are distinguished by having no teeth, but about three hundred thin horny plates in each jaw, which serve to retain the medusæ and other small creatures on which whales feed, while the water



THE GREENLAND WHALE. (*Balæna mysticetus.*)

escapes between them. In this picture of the Greenland whale, the horny plates are plainly shown. The term whale-*bone* is incorrectly applied to this substance."

"You spoke of the true whales, papa; but what others are there?"

"There are the Sperm Whales, with teeth in the lower jaw, and no whalebone. These are very large and furious creatures, able to dash a boat in pieces with a single blow of the tail; but they are diligently pursued for sake of the *spermaceti* which is obtained from their heads, and also for the *ambergris* often contained in their intestines; the latter, which is used as a perfume, is said to be formed during a diseased state of the animal. There are also the Narwhals, a family of whales having an enormous tooth or tusk projecting several feet. There are also the Dolphins* and Porpoises,† which both have the habit of leaping in the water, and thus becoming visible in large shoals. There are also whales with flat grinder teeth, which feed on the plants growing at the mouths of tropical rivers, and which are therefore called Sea-cows, or Cow-whales. The stomach in these animals is formed in a similar manner to that of the ruminating animals, which order we must now proceed to notice, leaving these water animals for creatures that tread the solid earth."

---

* Delphinus.

† Phocæna.

"I know what is meant by 'ruminating animals,'" said Mary; "they are creatures that chew their food twice over, like the cow and the sheep."

"Right," said her father; "and all these animals afford wholesome food to man, while many are also his strong and patient labourers, as the ox, the camel, and the reindeer."

THE BISON. (*Bos bison.*)

"And how many useful things we get from them to wear and to use!" said Henry, "such as leather, horn, wool, and tallow. Papa's clothes and mine are made of wool, and so are the carpets, and the blankets, and a great many other things in the house."

"The ox family," continued his father, "contains the Buffalo of India, and of the Cape, also the formidable Bison of North America, the small Yak of Thibet, and the Aurochs, a ferocious animal inhabiting the forests of Poland and Russia. Of sheep and goats there are several wild species; but from which of them our common domestic animals originally sprang we can get no certain information. The origin of our sheep is generally referred to the wild sheep of Siberia. The next family of ruminants consists of the Antelopes."*

"And they are beautiful creatures," said Mary. "I have seen a tame gazelle, with its slender limbs, and large dark eyes, and I could scarcely bear to part with it. The dear little creature ate from my hand, and seemed quite affectionate; but it was very particular in its eating; when

---

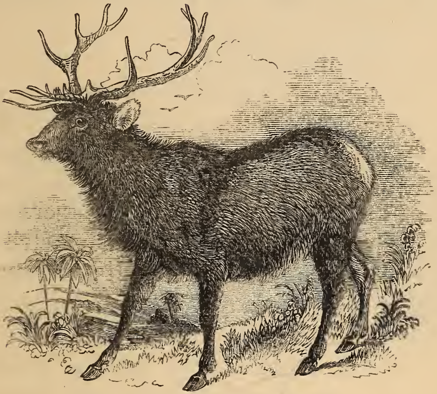
* Antilope.

THE ARGALI, OR WILD SHEEP.

I gave it a tuft of grass, it would only pick the most delicate shoots, and it bit off and threw away the harder stems, and every blade that was not perfectly clean."

"It was a beautiful and graceful creature," said her father, "but you must not suppose that all the antelopes are equally elegant. Many of them, indeed, are full of lightness and grace, but there are others which approach very nearly to the sheep and the ox, as the woolly antelope of America, and the large horned Gnu of Southern

Africa. We now arrive at the Giraffes* and the Deer, the former admirably fitted for browsing on the tops of trees, which their amazing length of neck enables them easily to reach, and the latter remarkable for their beautiful branched antlers, as well as for their fleet and graceful movements. Here is a picture of the Wapiti of America, which is of the same family with our stags, as are also those beautiful creatures,



THE WAPITI. (*Cervus canadensis.*)

---

* Camelopardalis.

the Muntjak of India, and the Roe of North Britain. The elk, fallow-deer, and reindeer, are also important members of this group, and not far off we find the family of musk animals, differing chiefly in the absence of horns."

Mary wished to know if these animals had anything to do with the musk used as a perfume. She was told that the substance is obtained from one species only, and is an oily matter secreted in a little bag beneath the belly of the male animal, which perfumes the air as he moves along. Her father said that musk, powerful as it is, is very much adulterated; for when taken from the body of the animal, and even when dried and ready for sale, it is so strong that persons are accustomed to cover the mouth and nostrils with folds of linen while examining it: without this precaution there is danger of serious bleeding of the nose from its penetrating odour."

"If that is the case," said Henry, "perhaps it is all the better for us that it does not come here in its natural state."

"The highest place among ruminating animals," resumed his father, "is filled by the gentle and laborious Camel, whose history is too long and too interesting to be attempted now. You have lately read an account of this patient creature, and you know that it has no horns, that its feet are protected by a soft pad, causing it to have a singularly noiseless step, and that on the back are large humps of fat, which seem to nourish the animal during its long fasts. The Bactrian camel has two humps, the Arabian one; but the latter is the common and invaluable animal so much used in crossing the deserts. The Lama is an animal

THE LAMA. (*Auchenia Glama.*)

much resembling the camel, and used also as a beast of burden, but is destitute of humps. It is gentle, if well used; but it has a strange habit of spitting at any person who excites its anger. This is its only method of taking revenge when overloaded or cruelly treated.

"Not a very pleasant one, certainly," said Mary; "but I almost wish some of the poor animals that are ill-treated in our streets would reward their drivers in the same way."

"All these ruminating animals," said her father, "are entirely vegetable feeders, and have four stomachs, into which the food is received in succession. When it reaches the second stomach it is brought again to the mouth in small portions, which are afterwards conveyed to the third, and thence to the fourth stomach, until this long process is complete. Thus all the nourishment possible is obtained from the food. Ruminants are without front teeth in the upper jaw, and they have also the cloven hoof, so often mentioned in Scripture as belonging to those animals on which man may feed."

"What animals come next to ruminants?" asked Henry.

" As we ascend," replied his father, " we come next to those valuable creatures, the horse and ass. Related to the latter are the handsome zebras and quaggas of Southern Africa. These belong to the order of thick-skinned animals, of which you saw remarkable examples in the large rhinoceros and elephants in the Regent's Park."

" It does not seem right," said Henry, " to put our beautiful horses in the same order with those clumsy creatures."

" The huge creatures of which the order chiefly consists are protected by their thick skins, more than by any covering of hair. If you remember, the elephant is almost entirely without hair, and many of the others have only a few scattered bristles. In the hot countries inhabited by these animals the thick skin defends them from the attacks of insects, and is still further hardened by the habit of rolling in the mud which most of them indulge in. They are vegetable feeders, but do not ruminate like cows and sheep."

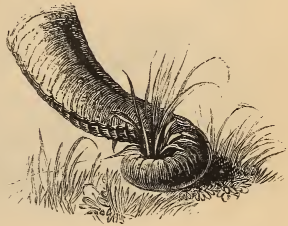
" The legs of the elephant are very clumsy," said Mary; " they are nearly of the same size all the way down, and look stiff and awkward."

" Consider what a vast weight they have to bear," said her father; "the stiffness you complain of is much to be admired when we think of them as the pillars of a huge edifice. Perpendicular columns are best fittted to bear heavy weights, therefore the straight and bulky legs of the elephant are just suited to its wants. See also what a thick neck the animal has; this is also necessary to support the great weight of the head and trunk, and you will be surprised to hear that it contains just as many vertebræ, or joints, as the long neck of the giraffe."

The children wondered at this, and thought the joints must be very close together. Their father told them that in the whole of the great division called *mammalia*, or animals which suckle their young, there are seven vertebræ in the neck, the number being just the same whether the neck be long or short. "In the giraffe," he said, "they are seven long tubes, joined together endwise, while in the dolphin, and other creatures which appear to have no neck, the joints are close together, and often united in one. It is interesting to find a strong resemblance in the formation of all these creatures, and that the same organ, however modified in shape and size, is always found in its proper place. So much harmony, united with infinite variety, is found in the works of God."

"Is not the elephant's trunk very different from anything which other animals have?" asked Henry.

"It certainly is a most unusual lengthening of the upper lip, but the reason for this variation only forms another subject for admiration. The elephant without this trunk would have no means of reaching the herbage on which it feeds. The enormous weight of the head is a sufficient reason why the animal could not have a long neck like the horse and cow; but this trunk answers every purpose of lip and hand too, and is most curiously formed for taking up small substances and for tearing up grass, &c. to convey it to the mouth."



USE OF THE TRUNK IN GATHERING GRASS.

The children were here shown a picture of elephants lying down. But their father told them that elephants also find great rest in merely standing still, their strong legs serving as props. "You were quite shocked," he said to Henry, "when the keeper told you that the poor sick elephant in the Zoological Gardens had not lain down for nearly two years, but what I have just said will in some measure explain it."

ELEPHANTS SLEEPING.

"Poor creature!" said Henry, "I shall never forget him; he groaned, and looked so very sad, and always held up one foot to prevent its touching the ground."

"He was suffering," said his father, "from a disease to which elephants are liable, being a great enlargement of the leg, accompanied with pain and inflammation. This poor animal would never allow his leg to be examined, or remedies applied. He died not long after our visit."

"I have read," said Mary, "that elephants' tusks often weigh seventy pounds the pair."

"Sometimes much more," said her father. "They are most formidable weapons, as are also, in a less degree, the tusks of the wild-boar. There is a sort of wild-boar called the Wart-hog (on account of some wart-like knobs on its face), which is very much dreaded in Southern Africa. It has four tusks projecting from the sides of the face, and it will sometimes throw a man down and wound him fatally before he can produce any weapon of defence; the suddenness of its attack makes it a more fearful enemy than even the lion. River-horses, as well as these boars, belong to the thick-skinned animals, and possess tusks."

"River-horses are very terrible creatures, are they not?" said Robert.

"They are very large and ungainly creatures, but their terrors have been much exaggerated. They live immersed in rivers, and are inoffensive, unless irritated. The skin is more than an inch thick, and the tusks form the whitest ivory. Very different from these tusks is the curious horn of the rhinoceros placed on the nose; yet even this is a dangerous weapon when the animal is enraged. I shall only mention two more of these thick-skinned creatures, the Tapir, and the Peccary, the former with a short proboscis, reminding one of the elephant, the latter with a snout and manners resembling the hog. All these creatures, as well as the ruminants, have hoofs; but we now leave the hoofed animals for those which have claws."

CONVERSATION XXI.

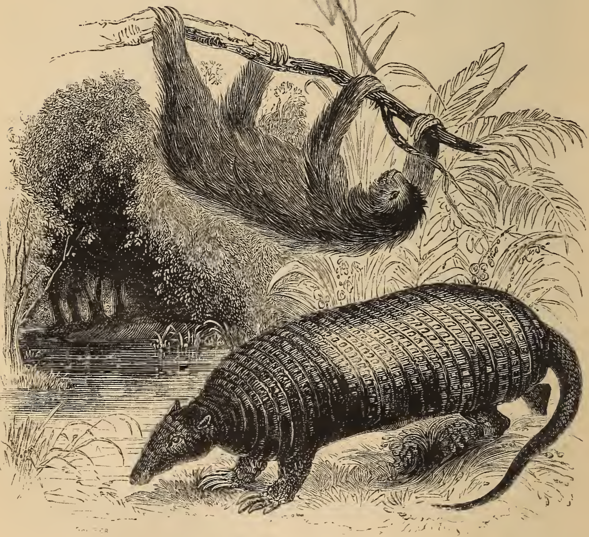
Animals having Claws.—*Edentata, Rodentia.*

"Now, Miss Puss, I suppose we are going to hear your history, for you have claws, and very sharp ones too." So said Robert, as he stroked a favourite tabby cat which lay purring on the hearth-rug.

"Not just yet," said his father; "there are many other clawed animals to notice before we reach the family to which puss belongs. The lowest order, and that which comes nearest to the thick-skinned animals, is one which contains the sloth, armadillo, ant-eater, and some other foreigners. This order is called *edentata*, because all the animals are without front teeth: they feed mostly on insects, but the sloths appear to be fond of fruit."

"The sloth gets its name from being very lazy, does it not?" said Mary.

"From an appearance of laziness, and from a certain loose and awkward motion of the limbs, but not from real indolence. An eye-witness of his actions says, 'He travels at a good round



THE SLOTH AND ARMADILLO.

pace; and were you to see him, as I have done, passing from tree to tree, you would never think of calling him a sloth.'"

A picture was here shown of the Sloth and Armadillo, the former hanging from the branch of a tree. The children asked "if it was swinging there for amusement, as monkeys do sometimes?" but they were much surprised to learn that it lives, and feeds, and sleeps, in that position, being formed, not for walking upon the branches, but for clinging to them with its head downwards."

"That is as strange as the fly walking on the ceiling," said Robert. "Has it any suckers in its feet, to hold tightly to the branches?"

"No; but very curious claws, longer than the sole of the foot, and strongly bent inwards, so that they hold fast without any effort of the animal. When the poor sloth is placed on the ground it is almost helpless, not being able to open these claws sufficiently to fix the sole of the foot on the earth. It may then be easily mistaken for an indolent creature; but place it on a tree, and it no longer deserves the character."

"Of what colour is the sloth?" asked Mary.

"It is of a dull brown, and has loose coarse hair, which has been likened to withered grass. It is what you would call a very shabby animal; but it is well fitted for its mode of life, and for concealment among the leaves of trees. Sometimes it has a little one clinging to its breast, but it still moves along on the under side of branches, without appearing inconvenienced by the additional weight."

"That armadillo looks as if it were cased in armour," remarked Henry.

"And it is a sort of armour, curiously jointed and fitted, which covers the body. These animals burrow in the sand like rabbits, and feed on vegetables and insects; they are harmless creatures, inhabiting South America. These two examples will give you a sufficient idea of the order, and we will therefore proceed to the next, which I am sure will interest you, being that of the *rodents* or gnawing animals."

"But do not all animals gnaw?" asked Robert.

"Not in the manner of these, which have two long sharp front teeth in each jaw, fitted for gnawing or nibbling solid substances."

"Then I dare say mice, and rats, and rabbits, and guinea-pigs, are rodents," said Henry, "for they have sharp nibbling teeth."

"And so have squirrels," said Robert; "they soon make a hole in a nut, and get out the kernel."

"The Porcupine and the Beaver are of this order, the latter a valuable fur-bearing animal; also the Grey Squirrel and the Chinchilla, whose fur you know so well."

THE CHINCHILLA.

"Those are porcupine-quills which mamma uses as pen-holders," said Mary; "they are mounted with silver, and look very pretty. Does not the porcupine shoot out his quills at people when he is angry?"

"It was long thought so, but it proves to be a mistake. When attacked he raises them in defence, and an enemy rushing against them would be pierced and injured; but he has no power to cast them forth like javelins. They are slightly attached to the skin, and are occasionally dropped as the animal moves about, which perhaps gave rise to the common opinion."

Henry said that he knew something about the habits of the beaver, having read an account of their building a dam across a small river by first cutting down young trees and laying them across, and then bringing stones, and clay, and branches, till they had quite stopped back the stream, and obliged it to find another channel. Some of these trees sprouted afresh, so that there was quite a little hedge across the stream. "Their sharp gnawing teeth were made good use of," he added, "in cutting branches for their work, and their tails were used to support them, and not, as I had supposed, to plaster the mud like a mason's trowel."

" About this dam," said his father, " they build their own houses of similar materials, and with the entrances under water, for these creatures swim and dive well. The habit of building is so strong in them, that even in a state of captivity they seize any materials that come in their way for that purpose. A young beaver kept in a cage, was sometimes let out in a room where various articles were purposely left in his way, and this is the use he made of them. He would drag along a large sweeping-brush or a warming-pan, grasping the handle with his teeth, and walking sidewise till he came to the place where he wished to place it. Two such long articles were generally laid cross-wise, with one of the ends touching the wall, and the other projecting into the room; the space formed between the long brushes and the wall he would fill up with hand-brushes, rush baskets, books, boots, sticks, cloths, dried turf, or anything he could carry. As the pile grew high he supported himself on his tail, and appeared to consider his work; and if it did not exactly please him he would alter the position of some of the materials. This he seemed to consider as the dam, and for his own dwelling he walled up the space between the feet of a chest of drawers, which stood high enough on its legs to allow of his creeping under. He made this wall of turf and sticks, and any little spaces that were left he stopped up with bits of coal, shreds of cloth, or anything else he could pick up. When all was done, he would accumulate hay, cotton, &c. for making a nest, and would then sit up and comb himself with the nails of his hind feet."

"Poor fellow!" said Mary, "how disappointed he must have been when he was put into his cage again, and perhaps saw all his work swept away!"

Robert wanted to know why beavers make such buildings; and he was told that in them they store up large quantities of twigs and bark of trees for their food in winter, and that being partly water animals, they naturally choose the banks of rivers for their home. "Resembling the beaver in some respects," said his father, "is the Duck-bill, a strange animal found in Australia, and called by the colonists the 'water-mole.' This creature has soft fur, and a flat tail, is aquatic in its habits, and burrows in the earth near rivers; but it is remarkable for a broad spoon-bill, much like a duck's bill, with loose folds of black skin at its base, which give the appearance of the bill being artificial, and fastened on by these fleshy bands. Not much unlike the porcupine is another curious animal of the same country called the Porcupine Ant-eater, with a long and slender muzzle covered with thick skin, and a bristly coat of spines and stiff hair. This animal has a long and glutinous tongue, which is thrusts out suddenly to feed on ant eggs. I shall not relate the history of rabbits, hares, squirrels, mice, or rats, because it would occupy several hours, and you are besides so well acquainted with these creatures. There are various rabbit-like animals called Jerboas, remarkable for the shortness of their fore legs and for the size and strength of the hind legs, which enables them to leap and run very swiftly. They are natives of warm countries of the east, and feed chiefly on bulbous roots, which they dig up with their fore feet. I shall not detain you any longer with the rodents or gnawing animals, except to notice the remarkable growth of their front teeth. By constant use they are worn down to keep pace with their growth, but if the animal happens to lose one, then the fellow to

THE JERBOA.

it in the opposite jaw, not being kept in check, grows out into a long uncouth fang of very strange appearance.

"Oh, papa," said Mary, "that explains about the skull of a rabbit which Uncle Henry once had. Do you know that when he was a little boy he had a favourite black rabbit; I do not think it had any white at all about it, and as the rabbit grew old, one of its upper teeth began to grow out, and the long white tooth came down over the black under lip. Well, it grew longer and longer till at last the poor rabbit could not eat on account of it, and so it was starved to death. Uncle Henry buried his favourite, and a long time afterwards he dug up the skull, and kept it, with the tooth in it, as a curiosity."

"If you had examined that tooth, you would have noticed that the inner side is made of a darker looking substance than the outside, for it is in front only that the teeth of these animals are covered with enamel; in consequence the inner side wears faster than the outer, leaving always a sharp keen edge. I do not know whether this gave the idea, but ploughshares and other implements are now made of two sorts of iron, one harder than the other, so that by their unequal wear a sharp cutting edge is always preserved without the trouble of grinding."

"What creatures come next to the rodents?" asked Henry.

"A very important order, containing nearly all the quadrupeds yet discovered in Australia, besides some American animals. The females are all distinguished by having a pouch or pocket, in which they carry their young until they are strong enough to take care of themselves."

Mary laughed at the idea of the mother carrying her little ones about in her pocket; but she did not think it so ridiculous when she heard that the young are at first very small and helpless, and only able feebly to move their limbs.

"But where is the pocket?" said she; "and how does the mother manage not to let them fall out as she walks about?"

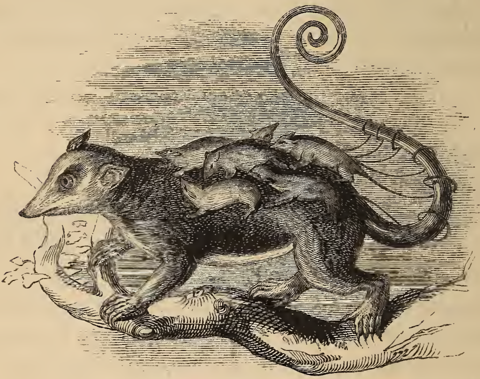
"The pocket is generally formed by a double fold of the skin of the stomach, and is capable of being very firmly closed. Inside it are the nipples, and the little ones hang to them and are nourished. The kangaroo is one of these pouched animals, and you will be surprised to hear that it carries about its young for a period of eight months. A little kangaroo may then sometimes be seen putting its head out of the pouch, and nibbling the short grass at the same time with its mother. At last it ventures forth from its hiding place, and tries its strength alone; but on the least alarm it springs again into the old place. It also puts in its head occasionally to suck, not being able all at once to give up its milk diet."

"And at last, I suppose, it learns to leap and run like the old ones," said Henry; "for I have read that they leap over hedges and ditches as if they were flying."

"They are able to do so by means of the enormous length and strength of the hind legs, which are also powerful weapons, being armed with long sharp claws; the fore feet are extremely short in proportion. Kangaroos are naturally gentle and inoffensive creatures, but when hunted for the sake of their flesh, (which is much prized,) they will at last turn upon the dogs, and often maim or kill them, tearing them open with their powerful hind claws. Less interesting than the kangaroos are the opossums of North and South America. The Virginian Opossum lives among the branches or in the hollows of trees, remaining torpid by day, and prowling about for food in the night time; it eats eggs, insects, birds, reptiles, fruit, and roots."

"If it can climb trees it cannot have long leaping legs like the kangaroo," said Henry.

"The legs are short, and the feet furnished



OPOSSUM AND YOUNG.

with strong curved claws. The female has several little ones to take care of, and when they leave the pouch, we are told that on any alarm they will jump on their mother's back, and twisting their tails round hers, trust to her care to carry them out of danger. The same habit is observed in an opossum, a native of Surinam, of which the above is a representation."

Mary was quite delighted with the picture of the little opossums and their mother, and laughed very much at the use they made of their tails.

"It would be useless," said her father, "to tell you the names of other families of these pouched creatures, for they are not yet familiar enough to interest us; therefore let us proceed at once to the great order of carnivorous, or flesh-eating animals."

"Joy! joy!" said Robert; "now we shall come to the lions and tigers."

"According to our plan of beginning with the lowest and travelling upwards, we must take the amphibious animals of this order before we come to your terrible favourites; for here, as in former orders, the lowest place is occupied by animals which live chiefly in the water. The Walrus, also called the Sea-horse and the Morse, is larger than an ox, and has two tusks of a beautiful ivory, projecting downward to the length of two feet. The fore legs are short and fin-like, and the hind are broad and flattened, answering the same purpose as the tail in dolphins and whales. This animal forms the connecting link between this order and the last, and is partly, if not entirely, a herb-eater. The Seal, which much resembles the Walrus in shape, feeds on fish, and we are told that one in a state of confinement ate thirty pounds of living fish, usually eels, every day."

"It must have been a large creature to eat such a quantity of food," said Robert.

"It was seven feet and a half long, and is described as being an obedient and even affectionate creature. There is a much larger species than this, called the elephant seal, sometimes thirty feet long, and eighteen thick. I dare say you, Henry, who are so fond of reading, have seen an account of the seal fisheries of Newfoundland?"

"Oh yes, papa, and of the cruelty of the fishers, who very often begin to cut and tear off the skins of the seals before they are dead."

"What do they want the skins for?" asked Robert.

"To get the thick fat which comes off with them," said his brother, "and which makes seal oil. The skin itself too is used as a fur, or it is made into leather. The poor little seals that are just born are very fat, and the fishers look out for them on the ice in the North Sea, and kill great numbers of them. The oil is better from them than from the old ones."

"The common seal and the harp seal," said his father, " are the species chiefly sought by northern fishermen. The elephant seal belongs to the southern hemisphere, and is the object of the seal fisheries in the South Pacific. Hundreds of these enormous seals may be seen lying among the grass near the sea shore, and so rich are they in oil, that when they crawl along, their bodies tremble like immense masses of jelly."

" Fancy a jelly-bag thirty feet long !" exclaimed Mary.

" We come next to the cat family, in which the appetite for living flesh is very strong, and which is perhaps the most ferocious family in the animal kingdom."

" Do you hear that, puss ?" said Robert. "You look so innocent that no one would think you belonged to such a fierce family."

Mary was also surprised to hear this of her favourite, until she learned that the cat tribe contains the lion, tiger, leopard, and other beasts of prey. She was also told that there are still wild cats in some of our forests, which subsist on birds, rabbits, and leverets, and are very bold and savage creatures, larger than the domestic cat, and supposed to be a distinct species.

"I cannot describe the various wild cats of different countries," continued her father, "including tiger-cats, ocelots, &c. and their thickly-furred relations the lynxes, but I must proceed at once to the larger animals. There are three powerful animals so much alike in their general appearance, that I doubt whether you would not call them all leopards, from their spotted coats; these are the Panther of Africa, the Leopard of Asia and Africa, and the Jaguar of South America. The leopard is smaller in size and of a paler yellow colour than the panther, and the spots are rather different in form; but both animals are extremely beautiful and easily tamed. The jaguar is much larger and more savage. Sometimes a black variety of panther is met with, and there was one not long since in the gardens of the Zoological Society.

"I saw it," said Henry, "and wondered why it would not come down from its shelf even at feeding time; the keeper threw up a leg of mutton, but it slipped off the shelf, and the panther was too lazy to come down for it."

"The poor animal was ill, and that was the reason why the keeper tried to tempt its appetite with meat superior to the rest, but without success; and you must know that most of this cat family,

THE JAGUAR, BROWN BEAR, AND FOX.

except the lion and tiger, are fond of climbing trees, therefore it is not to be wondered at that they prefer the shelf at the upper part of the cage. I should like to tell you a long story about a tame panther, but I think I must leave you to read it for yourselves."

The children begged so earnestly for the story, that their father abridged it for them thus:—

"Two young panthers were once found in a forest in Africa, apparently deserted by their mother, and they were taken to the king of Ashantee, in whose palace they lived several weeks; but the larger of the two played so roughly with his poor little brother, that he suffocated him in a fit of romping. The survivor was then presented to the governor of Cape Coast Castle, and was led through the country thither held by a chain, being let loose at meal times and treated like a dog. On the day of his arrival, he was led by a thin cord into the room where the governor and some ladies were sitting; he was very good humoured, and on the least encouragement he clapped his paws upon their shoulders, and rubbed his head upon them. His teeth and claws had been previously filed, so that his rough caresses did not tear the ladies' clothes. One day he broke his cord, and ran about the castle, and before he could be caught he knocked down two or three children by bouncing against them, but he did no further injury. At last he became so tame that he was left free within the castle walls, and a boy was set to watch that he did not intrude into the officers' apartments. One day, instead of watching, the boy went to sleep on the step of a door, when the panther came up, lifted his paw, and gave him such a severe box on the ear that it laid him flat, while Sai (as the panther was called after the royal giver) stood wagging his tail, and enjoying the mischief. Sai was very fond of his master, the governor, and out of spirits when he was away. Once when the governor had returned to his room after some absence, he heard a heavy step coming up stairs, and the moment after he gave himself up for lost, for the panther sprang from the open door immediately on his neck, but it was only to lay his head close to his master's, and rub his cheek against him, which was his way of showing his affection.

"It seemed as if Sai took a mischievous pleasure in frightening people, for one day when a poor woman was sweeping the floors with a short brush, and was nearly on her hands and knees, Sai, who was hidden under a sofa, suddenly leaped upon her back, where he stood in triumph. Her screams brought assistance, but she was long ill of the fright. Sai was very fond of little children, and so gentle with them that even the infant was caressed by him without being hurt. At last Sai was taken away from the castle, and brought by one of the ladies to England. He was carried on board in a strong cage, and was very angry until she appeared, when he was almost frantic with joy. He was very fond of lavender water, and she indulged him with some twice a-week in a little paper tray, which he would drag into the cage with great eagerness and roll himself over and over upon it. He once tore a pocket handkerchief to atoms which had some of this scent upon it. He had a great hatred for monkeys and black men, so that when an orang-otan was brought on board, his back rose in an arch, as the cat's does at the sight of a dog, his tail was quite stiff, his eyes flashed, and he howled, showing his huge teeth. On the way home the ship was boarded by pirates, and the crew almost starved; poor Sai's allowance was a parrot a-day, for there were many of these birds on board, and they died in great numbers.

On this scanty diet he became so ravenous that at last he ate feathers and all, which soon made him ill. On his arrival in London he was presented to the Duchess of York, and was placed for a few weeks at Exeter Change until she herself went to Oatlands. The morning of her departure she visited her new pet, played with him, and admired his gentle manners; but in the evening, when her coachman went to take him away, he was dead from inflammation of the lungs."

"Thank you, papa, for this pretty story. I am very sorry poor Sai did not live to play some more of his odd tricks."

"There was a person besides his noble friends who must have been sorry for Sai's death; I mean the boy who had the charge of him during the voyage, and who was so much attached to him, that when the poor animal was suffering from his parrot diet, his young keeper actually crept in and slept in the panther's cage."

"How very dangerous!" said Mary, "for Sai's illness might have made him peevish and angry, and then he might have killed his poor little keeper. Are panthers very fierce by nature?"

"They are so; but their prey is chiefly monkeys, which they pursue among the branches; or deer and antelopes, which they drop down upon

THE TIGER. (*Felis tigris.*)

from the trees. But let us now proceed to the tiger, that fierce and dangerous creature, which so often attacks men. It is confined to the continent of Asia, and is hunted with great eagerness by our fellow-countrymen in India. It is certainly the finest and most fearful of those creatures which closely resemble the cat; its markings are not unlike some of our handsome tabbies. Towards nightfall this terrible creature creeps to the edges of forests or rivers where men and animals are likely to resort, and springs unawares on his victim, as a cat would spring at a bird. When an animal is once in its power it rolls round on its back, clasping firmly its prey, and fixing its hind claws near the throat it kicks or pushes backwards with such violence as to tear the animal open in an instant."

"And does the lion do the same?" asked Robert.

"No; he springs upon his prey, indeed; but the force of his powerful body is supposed in many cases to destroy life before his teeth are employed. This fine animal, distinguished from all the rest of the cat race by his noble head and mane, is chiefly found in Africa, where he reigns like a king over other animals, and finds abundant food in the herds of antelopes and other wild inhabitants of those solitary plains. Anecdotes of his power and habits are so common that I shall leave you to find them out for yourselves, merely adding that he possesses, like all the rest of the cats, the stiff projecting bristles or whiskers on the cheeks, the sharp teeth and claws, and the elastic pads on the feet; and that notwithstanding his great power and majestic appearance he is inferior in sagacity to another family of animals in this order, namely, the dogs.

"Just as Tabby is inferior to Rover," said Henry, "and does not understand so well what you say to her."

"The dog tribe is not to be judged by our domestic animal," said his father; "for this family contains the prowling wolf and jackal, the savage hyæna, and the cunning fox, besides various smaller animals of the civet family, which come rather nearer the cats. I shall not dwell upon these creatures, except to tell you that the Spotted Hyæna of southern Africa, though quite capable of being tamed, is yet, in its wild state, very ferocious, and evidently fond of human flesh in preference to that of other animals. It will pass through enclosures of calves to get at the centre of a hut, where it will steal away a little infant so gently that the mother is sometimes not aware of her loss until she hears the screams of the poor baby outside the hut."

"How dreadful!" exclaimed Mary. "And these creatures are really relations of our noble Rover? I hope, papa," she added, "that you are going to give us some anecdotes of dogs?"

"They are so numerous in several of your little books that I shall not repeat them now. It is my object to dwell chiefly on such subjects as you are not likely to meet with in your nursery books, and to pass lightly over those which are generally dwelt on. It is for this reason I have not given you the usual stories of lions and tigers, and the methods of hunting them. I want you to have some idea of the great scheme of the animal kingdom, and the order in which the various groups follow one another. In the same order with dogs and cats, we find those small animals the Weasels, including the ermine, ferret, polecat, and common weasel; the Martens, some of which produce the beautiful Siberian and North American sables; the Skunks, notorious for their offensive smell; and the Otters, which dive with great ease and swiftness in pursuit of fish. These and all the carnivorous animals I have yet named walk on their toes, and not on the whole foot. Look at the cat or dog, and you will see that this is the case, and that the real heel is raised from the ground. Hence they are all called *digitigrade*, which means 'stepping on the toe.'"

"And are there any that step on the whole foot?" asked Henry.

"Yes; bears, racoons, badgers, gluttons, and a few others: these are called *plantigrade*, or 'stepping on the sole.' You will be surprised, perhaps, to hear that the bats, which fly about old buildings in the twilight, and the industrious moles, that send up so many hillocks on the common, are included in this great collection of flesh-eating animals, although in many cases their food is of a delicate kind, as insects and small birds."

"But how can the mole get either," said Robert, when it is always underground?"

"Because a great number of insects live underground while in their imperfect and larva state, and these the mole hunts after, as well as after the common earth-worm. The hedgehog and the shrew belong to the same group as the mole."

CONVERSATION XXII.

MONKEYS.—CONCLUSION.

"Come into the garden, Mary," said her brother Robert. "Here is such a droll little monkey, dressed in a red jacket and hat. See how he takes off his hat when the man bids him, and holds it out for halfpence. And now he is running along the garden rails—and now he is climbing the sycamore. The man is obliged to pull hard at the chain to get him down again."

Henry ran to the gate with a piece of biscuit, and was diverted at the manner in which the monkey examined and picked it to pieces before he ate it. While they were watching his tricks, their father came up, and said that nothing could have been more fortunate than the arrival of this animal just at the time when he was going to describe the manners of the race.

"Any one can see that their home is in trees," said Henry, "by the way in which that monkey climbed the sycamore. How he flung himself from branch to branch, and swung about, as if delighted to get such an unusual length of chain!"

"Poor fellow! you can form little notion of the wonderful fleetness and rapidity of his tribe by seeing his cramped motions. Their home is in the tropical forests, and their climbing powers are most extraordinary; but their movements on the ground are always awkward and ungainly."

"Yes," said Mary, "that poor monkey does not put the whole sole of his foot on the ground, like the bears, nor even the toes, like the dogs, but he rests partly on the side of the foot, and turns the soles inwards."

"That position of the feet is very favourable for climbing; and, in fact, the hind feet, as well as the fore feet, are very much like hands, having a thumb as well as fingers, or toes, whichever we please to call them. Thus the whole order is called *quadrumana*, or having 'four hands.'"

"What a capital name!" said Henry; "and how I wish Mary and Robert could see the monkeys in the Zoological Gardens, and the way they use their four hands! They chase one another round their large cages, they grin, and chatter, and scream, and box each other's ears when they are angry; and at feeding-time, when the man brings a pailful of bread soaked in milk, and holds it for a few minutes at the door of each cage, it is so droll to see them dipping in their long arms and taking up as large a handful as possible, and running off to eat it in a corner of the cage."

"I remember your telling us about the old monkey and her little one," said Mary; "and how she tossed a nut about, as if to amuse her baby, while she kept one arm fondly round its neck."

"And about the mischievous young monkey," said Robert, "who put his hand through the wires of the cage and stole a blue veil from a child's bonnet, and ran up his climbing-pole with it, and would not give it up till his keeper went into the cage, and scolded, and threatened to beat him."

"They are very amusing creatures," said his father, "and there is great variety in their size, shape, and appearance. Some have very long and slender limbs, as the Spider Monkeys of America; others have a large projecting snout or muzzle, like a dog, as the Baboons of Africa and India; others are remarkable for the length of the fore arms, which, when the animal stands erect, touch the ground, as the Gibbons of the East Indian islands; others, again, are of a size and stature nearly approaching those of a man, as the Chimpanzee of central Africa and the Orang-otan of eastern India."

ORANG OTAN, GIBBON, AND SPIDER MONKEY.

"Did we see either of those animals among the other monkeys?" asked Henry.

"No," replied his father. "The orang-otan died some time previously; but I once took a little girl to see him, and she was much pleased at his offering her his long black hand. He was a mild and gentle animal, and used to sit up very much in the posture of a human being, and shake hands with his visitors. My little companion had a parasol in her hand at the time of our visit, and she incautiously thrust it between the bars of the cage. The orang-otan immediately took it out of her hand and turned it about, examining it very curiously. At last, to our great amusement, he took the handle in his left hand, and opened the parasol with his right, looking up and admiring it as he held it over his head. He then let it fall on the floor of his cage, and began to pull and tear the silk, but by this time his keeper was aware of the theft, and made him give up his prize."

Robert asked if the orang-otan was very much like a man; and he was told that all these creatures, even those that have the most likeness to human beings, are yet very widely removed from them, in several most important respects.

"They cannot walk upright like men," said Henry.

"Some of them can walk for a short distance on their hind legs only, but it is in a slow and awkward fashion; and they frequently help themselves along by catching hold of trees or other objects with their arms, showing that the climbing habit is more natural to them. Man alone has the privilege of walking erect in an easy and natural manner."

" No wonder monkeys cannot walk comfortably," said Mary, " when all their feet are hands."

Her brothers laughed at this explanation, and went on finding out points of difference between monkeys and human beings, the greatest of all being the power of speech, which is reserved as the exclusive privilege of reasoning and immortal beings. Henry wondered why monkeys were so often said to be like human beings. " They are not much more clever or sensible than dogs," he said, " nor than the panther you told us about."

" There are resemblances of structure, known to anatomists; but no doubt great part of the outward likeness arises from the expression of the face being so shrewd and intelligent; monkeys also possess that wonderful and beautiful structure, *the hand,* and though it is in their case very inferior to that of man, yet it enables them to imitate his habits to a much greater degree than any other animal could do. The young of the orang-otan, or of the chimpanzee, can be taught to use a cup, spoon, or glass, very nearly as we do, and will afterwards place it carefully on the table, or hand it to some person near. One of them learned to eat strawberries, by taking up each separately with a fork. A traveller in Africa tells us that the chimpanzee further imitates the habits of man by building rude huts, which are not unlike those of the natives, and are covered with leaves in a similar manner. These are for the females and young, while the males lie outside. You will understand from this that the chimpanzees are not such constant dwellers in trees as most of their relations."

The children were here told that they had now reached the topmost round of the ladder of animal life, which is the place occupied by man.

"Is man an animal, then?" asked Robert.

"Certainly. He has an animal and mortal nature; but he has also a spiritual and immortal nature, for God has been pleased to raise man far above the beasts that perish, by the gift of reason, and by making him 'a living soul.' Our reason is, indeed, imperfect, as are all our powers; but God permits us to exercise and improve it, by studying his works, and learning some of the wonders of wisdom and goodness contained therein.

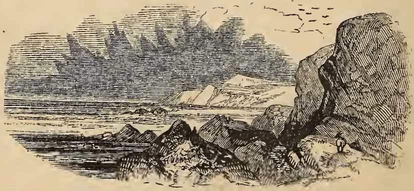
"Then out of this immense animal kingdom," said Henry, "only one creature can thank God for making him, and that is man!"

"True. He ought, therefore, to be the spokesman for all the rest; and to thank God, not only on his own account, but for all these creatures who are not able to praise him by their voices, although they constantly yield him honour by their wonderful structure and various instincts and powers. So plain is the witness creation bears to the wisdom and goodness of God, that we may well say, not of living animals only, but of inanimate things likewise,—

> " 'In reason's ear they all rejoice,
> And utter forth a glorious voice,
> For ever singing, as they shine,
> 'The hand that made us is Divine.' "

"I remember," said Mary, "learning a Psalm, where animals are called upon to praise God, just as if they had tongues, for it is said, 'Praise the Lord from the earth, ye dragons, and all deeps: fire and hail, snow and vapours, stormy wind, fulfilling his word: mountains and all hills, fruitful trees and all cedars, beasts and all cattle, creeping things, and flying fowl.' "

"Yes, dear children, God has made his meaner creatures according to their several powers to praise him: and shall we remain silent, who are so much more highly blessed? Has he not given us high and noble powers? and, these being debased by sin, has he not given us a pure and heavenly light to guide our erring steps,—even the gospel of our salvation, the good news of eternal life through Jesus Christ our Lord? Let us, therefore, praise him; let *children* praise him, for he has told them to do so. 'Both young men and maidens; old men and children; let them praise the name of the Lord; for his name only is excellent; his glory is above the earth and heaven.'"



FIRST STEPS IN GENERAL KNOWLEDGE.

THIS SERIES WILL BE COMPLETED IN FIVE PARTS,
IN THE FOLLOWING ORDER—

- PART I. THE STARRY HEAVENS.
- II. THE SURFACE OF THE EARTH.
- III. THE ANIMAL KINGDOM.
- IV. THE VEGETABLE KINGDOM.
- V. THE MINERAL KINGDOM.

NERAL KNOWLEDGE.

has made his meaner
everal powers to
lent, who are
ot given
ing

LONDON:
R. CLAY, PRINTER, BREAD STREET HILL.